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# TRAINING & PERSONNEL SYSTEMS TECHNOLOGY

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## R&D PROGRAM DESCRIPTION

FY90 - 89/90

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NOTICE

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Training and Personnel Systems Technology  
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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This notebook provides an overview of the amended Manpower, Personnel and Training (MPT) Program for FY89 and FY90. It has been assembled for use by laboratory planners, and managers and headquarters personnel in the Services and OSD. <i>Keywords</i>			
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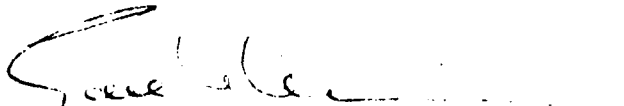
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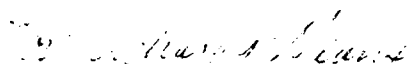
The Training and Personnel Systems Technology (TPST) R&D Program Description, as updated for FY 89-90/91, was prepared by the Defense Technical Information Center (MATRIS Office, San Diego). It is a product of the Office of the Deputy Director, Defense Research and Engineering (Research and Advanced Technology).

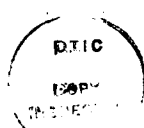
This document presents narrative and fiscal data available from the Services' revisions of the biennial FY 90/91 budget as of February 15, 1989. The MATRIS Office will continue to update its database as later information becomes available.

This R&D program description is produced and distributed annually in this aggregated and summarized form to provide an overview of the program, as well as fiscal summaries. It is intended to encourage and to enhance R&D coordination.

If additional copies are required, or if there are questions or comments, please contact the MATRIS Office by commercial telephone at (619) 553-7000.

  
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## I. INTRODUCTION

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This reference document presents a comprehensive overview of the Manpower, Personnel and Training (MPT) Technology Area for FY89 and FY90, summarizing the R&D Program, Basic Research through to Development (6.1-6.4). It consolidates Program Element and Project information and serves as a management tool for laboratory managers and planners and headquarters personnel in the Services and OSD.

This document integrates summaries of the work being conducted by the laboratories and associated funding in the form of narratives, tables, and listings. Comprehensive in nature and using a variety of formats, it allows the user to view, extract, and aggregate vital information for decision-making and resource commitment.

This document contains:

Fiscal tables and graphs (Section II)

This section encompasses a series of cross-tabulations featuring FY89 and FY90 funding figures by Congressional Categories, DoD Organizations, Budget Categories, and MPT Goals.

Graphic formats display data for:

- (A) A comparison of estimated vs. actual total MPT R&D funding for President's Budget 1985-1988.
- (B) Breakdowns of total MPT Program funding by Budget Category, Congressional Category and Service for FY89 and FY90.

Program Element and Project synopses (Section III)

This section presents synopses of each Program Element and its associated projects, sorted by DoD organization, including the products and payoffs of that work.

Overall synopses and Project listings (Section IV)

This section summarizes the work being conducted by each Service within each Congressional Category. Listings specify the Projects that fall within each Congressional Category for each Service and within each MPT Goal for each Service.

Appendices (Section V)

This section contains: (a) a list of the Congressional Categories and sub-Categories, (b) a list of the Goals used for this edition of the work, (c) a list of the Projects completed in FY89, (d) a list of the Projects to be initiated in FY90, and (e) a selection of policy-level memoranda that impact the MPT program.

### How to Use This Book

This document can be used in a variety of ways, depending upon the reader's needs. This discussion about how the book can be used is not intended to be comprehensive, but rather suggestive, through the use of several examples.

Let us look at how a reader might approach several different areas of interest using this MPT Program Description.

#### 1. Work being done in the area of Simulation and Training

One can begin with a brief overview of the area by turning to Section IV-A, pp. 4, 8, and 12, and seeing what each of the Services is doing in the area. A reader less familiar with the MPT Program can read the brief narrative associated with that Congressional Category for each Service. The pages following each such narrative contain listings of all the Projects under which work in Simulation and Training is being carried out. The Projects are sorted by Program Element.

It might also pay to glance at Appendix A, which contains a brief list of the Congressional Categories and subcategories.

Having gotten an overview, one can turn to several sections. Using the lists of relevant Program Elements and Projects for each Service, the reader can flip to Section III-A, B and C (Army, Navy, and Air Force, respectively) and scan the appropriate Program Element and, particularly, Project synopses to get a more detailed view of the objectives, plans, payoffs, and accomplishments of the work being carried out in the area. Within each Service subsection, the synopses are in order of Program Element, and within that by Project.

Finally, one can turn to the funding cross-tabulations in Section II, to gain a better analytic understanding of funding apportionment. Tables in subsections 2, 3, 4, 8, 9, 11, 12 all offer detailed information about how funding for Simulation and Training is allocated by Service, Budget Category, DoD Goal, and by Program Element. This way one can gain a feel of the relative weight (in terms of funding) being assigned to various areas.

Note: a similar "strategy" could be carried out to gain an overview of some MPT Goal (e.g., Goal 4, Designing for System Readiness) by: (a) starting out with Appendix B to look at the overall Goal structure, (b) turning to Section IV-B to locate the Program Elements and Projects involved with particular Goals, (c) scanning the relevant Program Element and Project summaries in Section III, and (d) examining the tables in the Goal-relevant subsections of Section II.

2. How do the Services' funding compare in FY89 and FY90?

The fiscal tables in Section II are most directly relevant for this. Tables in subsection II-1 provide a quick overview, breaking down the Services' funding by Budget Category and by Congressional Category for FY89 and FY90, respectively. Thus, one can compare the Services' funding with each other and determine where the emphases lie for each Service and the overall MPT program. By glancing back and forth at the top and bottom charts on the two pages, funding for the two fiscal years can be compared.

Page III-ii in the beginning of Section III shows actual and planned funding for the fiscal years 1987-1990 for each Program Element, sorted and totaled by Service.

Further detail in these categories and others can also be gained by turning to the tables in subsections II-4 and -5 (Budget Category by Congressional Category cross-tabulations, overall (4) and by Service (5) for FY89 and FY90), I-6 and -7 (Budget Category by MPT Goal cross-tabulations, overall (6) and by Service (7) for FY89 and FY90), etc.

3. What new research Projects will begin in FY90?

Turn to Appendix E. For greater detail, turn to the relevant synopses in Section II.

4. Which Projects will be completed in FY89?

Turn to Appendix C. For greater detail, turn to the relevant synopses in Section II.

5. What work is planned in FY89 in MPT Basic Research?

Basic research is Budget Category 6.1. Plans for research in FY89 and FY90 are contained in the narrative section (Section III) in the "Synopsis" portion of each Program Element and Project. Because the first two digits of each Program Element reflect the Budget Category it is in, and the Program Elements are in Program Element order, the 6.1 Program Elements and Projects can be easily located at the beginning of the narrative section for each Service.

Note: Plans for work beyond FY90 can be located in the "Future Directions" portion of each Program Element narrative.

6. What was accomplished in FY88 in Navy Human Factors work?

The past year's (FY88) accomplishments for each effort are located in the "Payoff/Utilization" portion of each Program Element and Project narrative in Section III. There are two ways of locating the Navy Human Factors efforts.

First, one could simply flip through the pages of subsection III-B (Navy narratives) and stop at each effort for which the Congressional Category is listed as "Human Factors".

Alternatively, as in Question 1 above, turn to subsection IV-A-5 and obtain the lists of Navy Human Factors Program Elements and Projects and then turn directly to the relevant narratives in subsection III-B.

#### Further Information

This document has been prepared by the Defense Technical Information Center, Manpower and Training Research Information System (MATRIS) Office, in San Diego. It is based on current Program Element and Project records in the MATRIS database, updated with the FY89/90 annual President's Budget submission.

The MATRIS database covers the MPT R&D Program at the Program Element, Project, and Work Unit levels. Further information about the MPT Program at any of these levels can be obtained by contacting:

MATRIS User Services  
Defense Technical Information Center, DTIC-DMA  
San Diego, CA 92152-6800

Phone: (619) 553-7000

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#### SUGGESTIONS and COMMENTS

This document offers an overview of the MPT Program based on the latest annual President's Budget. It is intended to be informative and to provide a wide variety of information.

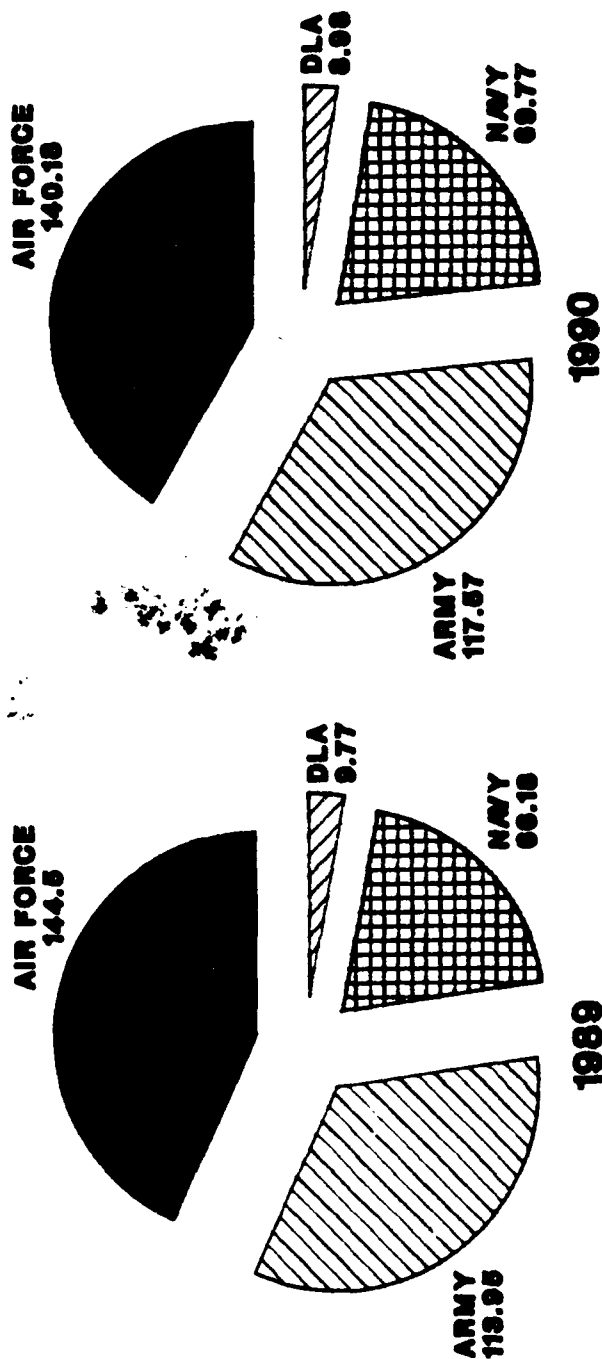
MATRIS, as the agency responsible for the production of this document, welcomes any suggestions for improving either the content, the presentation, or the timeliness of the MPT Program Description. If you have any suggestions or criticism which could help in improving the document, we would like to hear from you. This page of the Program Description has been included for your comments.

Please mail your comments and suggestions to:

Defense Technical Information Center, DTIC-DMA  
MATRIS Office, San Diego  
San Diego, CA 92152-6800

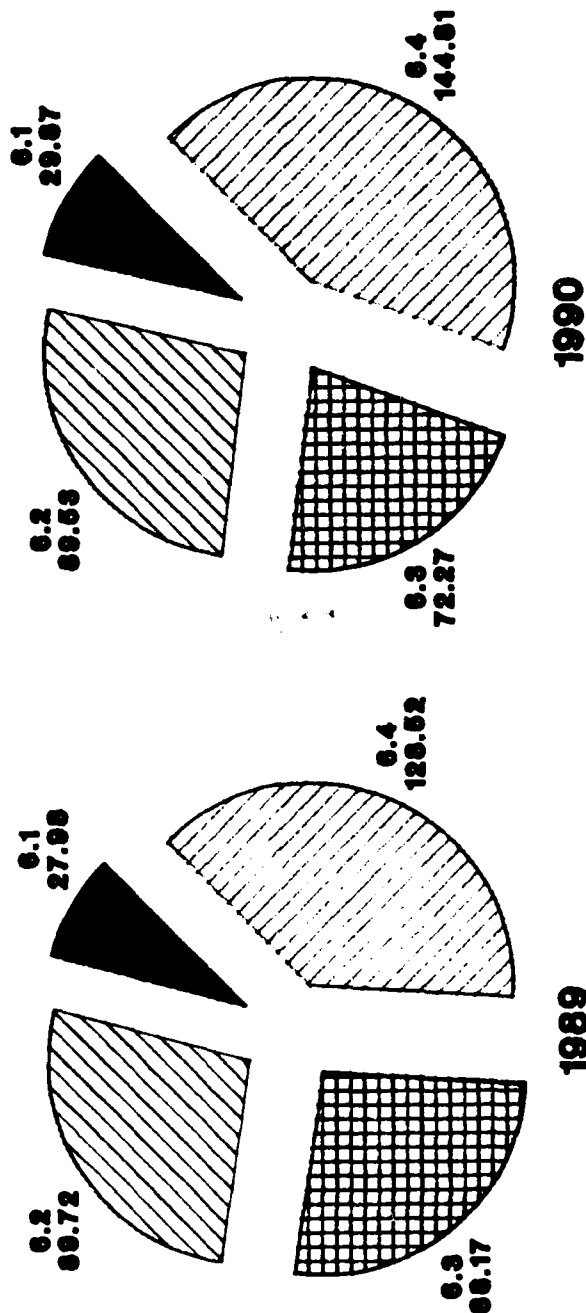
# MPT PROGRAM FUNDING BASED ON THE FY90/91 PRESIDENT'S BUDGET

## BY SERVICE



# MPT PROGRAM FUNDING BASED ON THE FY90/91 PRESIDENT'S BUDGET

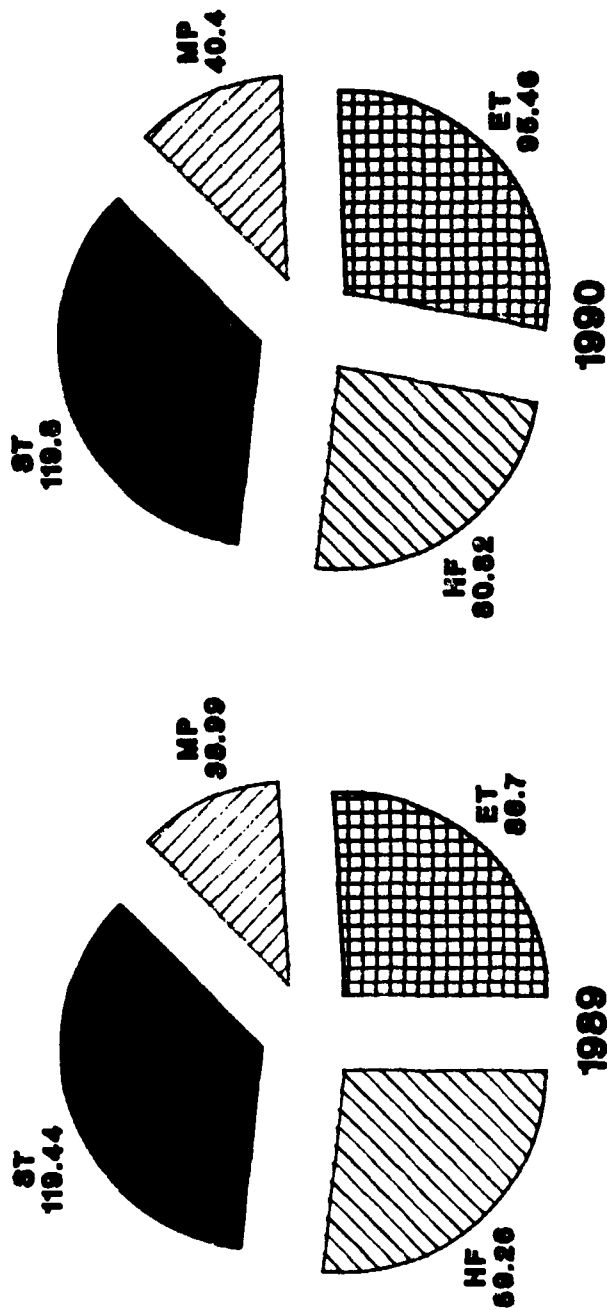
## BY BUDGET CATEGORY





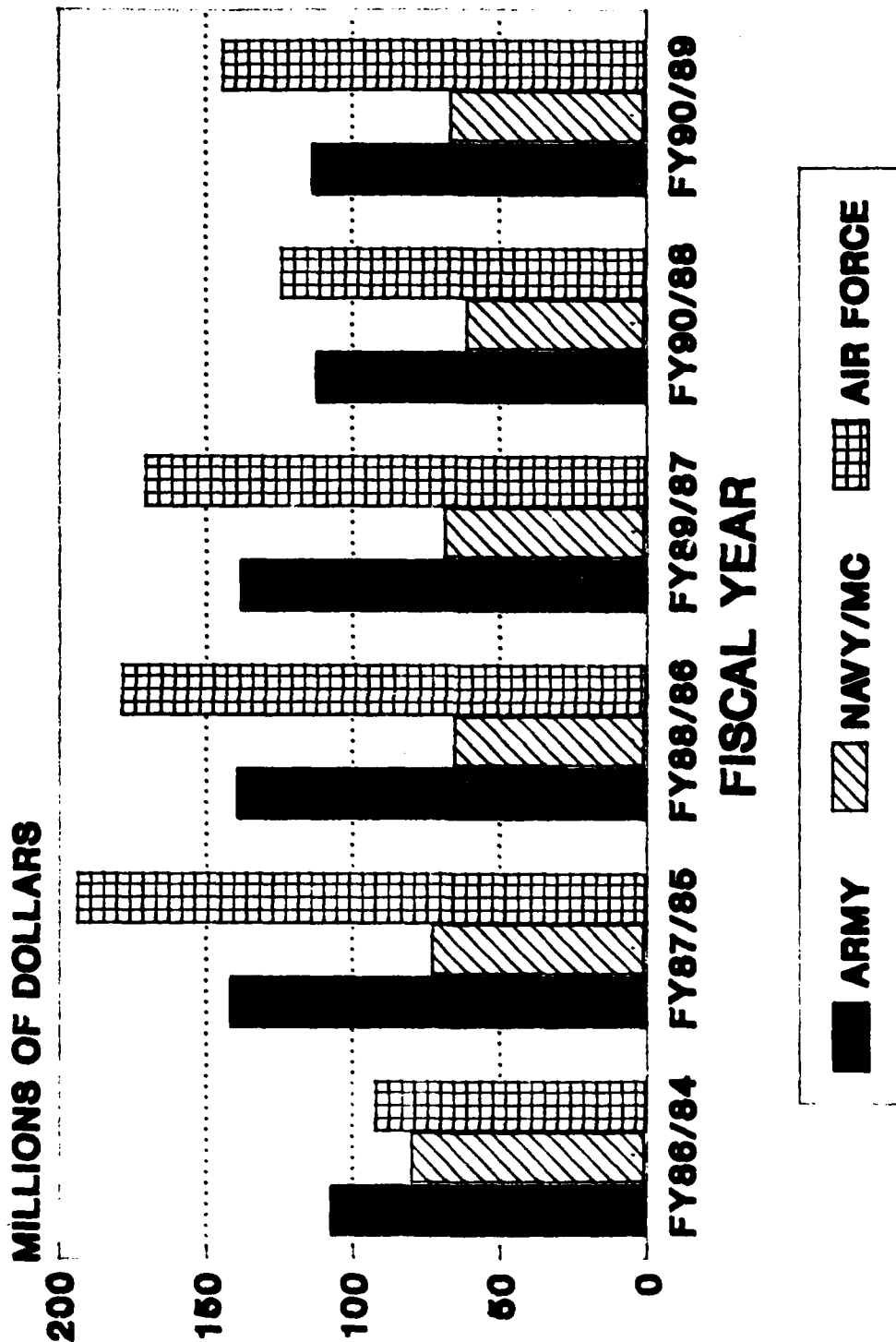
# MPT PROGRAM FUNDING BASED ON THE FY90/91 PRESIDENT'S BUDGET

## BY CONGRESSIONAL CATEGORY

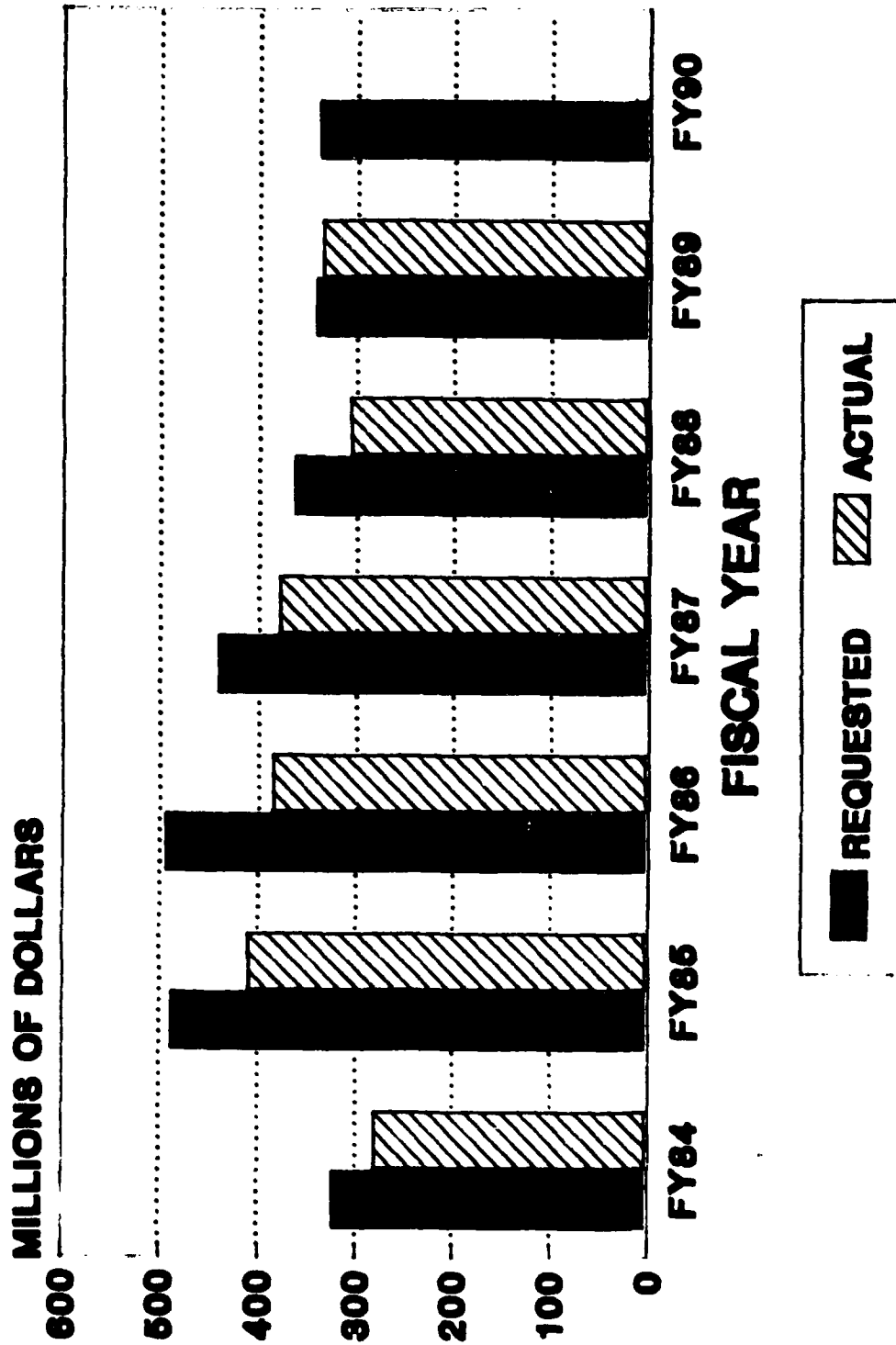


# ACTUAL MPT PROGRAM FUNDING BY SERVICE

## FY84 - FY88



# **REQUESTED VS ACTUAL PROGRAM FUNDING BASED ON THE PRESIDENT'S BUDGET (\*)**



(\*) FY84/84-FY90/90

## II. FISCAL TABLES

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NOTE: The percentages shown in each table may not total correctly due to rounding.

# LIST OF ABBREVIATIONS USED IN FISCAL TABLES

Variable Name	Abbreviation	Used For
CONGRESSIONAL CATEGORY	ET	Education and Training
	HF	Human Factors
	MP	Manpower and Personnel
	ST	Simulation and Training Devices
DoD GOAL	1	Management Trade-offs
	2	Accession and Retention
	3	Unit Productivity
	4	Designing for System Readiness
	5	Improved Sustainability
	6	Training Systems
	VAR	Various (i.e., project applies to more than one goal)
BUDGET CATEGORY	6.1	Basic Research
	6.2	Exporatory Development
	6.3	Advanced Development
	6.4	Engineering Development
DoD ORGANIZATION	ARMY	Army
	NAVY	Navy and Marine Corps
	AF	Air Force
	DLA	Defense Logistics Agency

TABLE II-1

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 BUDGET CATEGORY BY DOD ORGANIZATION  
 1989 (\$MILLIONS)

DOD ORGANIZATION	BUDGET CATEGORY				TOTAL
	6.1	6.2	6.3	6.4	
	-----	-----	-----	-----	-----
ARMY	7.37	36.18	34.58	35.84	113.97
(ROW%)	( 6)	( 32)	( 30)	( 31)	(100)
NAVY	11.50	11.31	23.59	19.77	66.18
(ROW%)	( 17)	( 17)	( 36)	( 30)	(100)
AF	9.11	42.25	30.01	63.15	144.53
(ROW%)	( 6)	( 29)	( 21)	( 44)	(100)
DLA	0.00	0.00	0.00	9.77	9.77
(ROW%)	( 0)	( 0)	( 0)	(100)	(100)
	-----	-----	-----	-----	-----
TOTAL	27.98	89.74	88.19	128.53	334.44
(ROW%)	( 8)	( 27)	( 26)	( 38)	(100)

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 BUDGET CATEGORY BY DOD ORGANIZATION  
 1990 (\$MILLIONS)

DOD ORGANIZATION	BUDGET CATEGORY				TOTAL
	6.1	6.2	6.3	6.4	
	-----	-----	-----	-----	-----
ARMY	6.77	36.37	22.12	51.45	116.71
(ROW%)	( 6)	( 31)	( 19)	( 44)	(100)
NAVY	14.08	11.73	25.25	18.71	69.77
(ROW%)	( 20)	( 17)	( 36)	( 27)	(100)
AF	9.02	41.44	24.05	65.69	140.20
(ROW%)	( 6)	( 30)	( 17)	( 47)	(100)
DLA	0.00	0.00	0.00	8.98	8.98
(ROW%)	( 0)	( 0)	( 0)	(100)	(100)
	-----	-----	-----	-----	-----
TOTAL	29.88	89.54	71.41	144.82	335.65
(ROW%)	( 9)	( 27)	( 21)	( 43)	(100)

TABLE II-2

MPT PROGRAM FUNDING IN 1989  
BASED ON FY90 PRESIDENT'S BUDGET

## CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	16.19 ( 14)	32.38 ( 28)	17.11 ( 15)	48.28 ( 42)	113.95 (100)
NAVY (ROW%)	13.92 ( 21)	10.48 ( 16)	13.94 ( 21)	27.82 ( 42)	66.16 (100)
AF (ROW%)	46.82 ( 32)	46.40 ( 32)	7.94 ( 5)	43.35 ( 30)	144.50 (100)
DLA (ROW%)	9.77 (100)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	9.77 (100)
TOTAL (ROW%)	86.70 ( 26)	89.26 ( 27)	38.99 ( 12)	119.44 ( 36)	334.39 (100)

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGET

## CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1990 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	9.83 ( 8)	27.92 ( 24)	16.40 ( 14)	63.42 ( 54)	117.57 (100)
NAVY (ROW%)	15.62 ( 22)	11.20 ( 16)	15.86 ( 23)	27.09 ( 39)	69.75 (100)
AF (ROW%)	61.04 ( 44)	41.70 ( 30)	8.14 ( 6)	29.30 ( 21)	140.18 (100)
DLA (ROW%)	8.98 (100)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	8.98 (100)
TOTAL (ROW%)	95.46 ( 28)	80.82 ( 24)	40.40 ( 12)	119.80 ( 36)	336.48 (100)

TABLE II-3

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT  
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		CONGRESSIONAL CATEGORY				
PROGRAM ELEMENT		ET	HF	MP	ST	TOTAL
		-----	-----	-----	-----	-----
ARMY						
61102A		0.81	4.34	0.93	1.32	7.38
(ROW%)		( 11)	( 59)	( 13)	( 18)	(100)
62716A		0.00	15.00	0.00	0.00	15.00
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
62727A		0.00	0.00	0.00	3.43	3.43
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
62785A		2.53	4.72	6.28	4.21	17.74
(ROW%)		( 14)	( 27)	( 35)	( 24)	(100)
63003A		0.00	0.00	0.00	5.38	5.38
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
63007A		5.99	8.32	9.91	4.98	29.20
(ROW%)		( 20)	( 29)	( 34)	( 17)	(100)
64715A		0.00	0.00	0.00	21.79	21.79
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
64722A		6.87	0.00	0.00	0.00	6.87
(ROW%)		(100)	( 0)	( 0)	( 0)	(100)
64801A		0.00	0.00	0.00	7.18	7.18
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
ARMY	TOTAL	-----	-----	-----	-----	-----
	(ROW%)	16.20	32.39	17.12	48.29	113.97
		( 14)	( 28)	( 15)	( 42)	(100)



TABLE II-3

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT  
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		CONGRESSIONAL CATEGORY				
	PROGRAM ELEMENT	ET	HF	MP	ST	TOTAL
		-----	-----	-----	-----	-----
AF						
	61102F	0.00	7.93	0.92	0.28	9.12
	(ROW%)	( 0)	( 87)	( 10)	( 3)	(100)
	62202F	0.00	11.39	0.00	0.00	11.39
	(ROW%)	( 0)	(100)	( 0)	( 0)	(100)
	62205F	9.10	5.58	6.34	9.84	30.86
	(ROW%)	( 29)	( 18)	( 21)	( 32)	(100)
	63106F	0.00	14.96	0.00	0.00	14.96
	(ROW%)	( 0)	(100)	( 0)	( 0)	(100)
	63227F	1.82	0.00	0.69	6.00	8.51
	(ROW%)	( 21)	( 0)	( 8)	( 70)	(100)
	63231F	0.00	6.54	0.00	0.00	6.54
	(ROW%)	( 0)	(100)	( 0)	( 0)	(100)
	64227F	35.90	0.00	0.00	27.25	63.15
	(ROW%)	( 57)	( 0)	( 0)	( 43)	(100)
AF	TOTAL	46.83	46.41	7.95	43.36	144.53
	(ROW%)	( 32)	( 32)	( 6)	( 30)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)			
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY			
		ET	HF	MP	ST
		-----	-----	-----	-----
NAVY					
61153N		6.33	2.42	2.76	0.00
(ROW%)		( 55)	( 21)	( 24)	( 0)
62131M		0.00	0.00	0.46	0.00
(ROW%)		( 0)	( 0)	(100)	( 0)
62233N		1.44	0.00	2.64	2.62
(ROW%)		( 22)	( 0)	( 39)	( 39)
62234N		0.00	4.15	0.00	0.00
(ROW%)		( 0)	(100)	( 0)	( 0)
63701N		0.00	2.46	0.00	0.00
(ROW%)		( 0)	(100)	( 0)	( 0)
63707N		0.00	0.00	3.98	0.00
(ROW%)		( 0)	( 0)	(100)	( 0)
63720N		6.15	0.00	0.00	0.00
(ROW%)		(100)	( 0)	( 0)	( 0)
63732M		0.00	0.00	3.09	0.00
(ROW%)		( 0)	( 0)	(100)	( 0)
63733N		0.00	0.00	0.00	6.45
(ROW%)		( 0)	( 0)	( 0)	(100)
63739N		0.00	1.47	0.00	0.00
(ROW%)		( 0)	(100)	( 0)	( 0)
64703N		0.00	0.00	1.02	0.00
(ROW%)		( 0)	( 0)	(100)	( 0)
64715N		0.00	0.00	0.00	18.76
(ROW%)		( 0)	( 0)	( 0)	(100)
NAVY TOTAL					
(ROW%)		13.93	10.49	13.95	27.83
		( 21)	( 16)	( 21)	( 42)

TABLE II-3

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGETCONGRESSIONAL CATEGORY BY PROGRAM ELEMENT  
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
ARMY		-----	-----	-----	-----	-----
61102A		0.71	4.13	0.81	1.15	6.78
(ROW%)		( 10)	( 61)	( 12)	( 17)	(100)
62716A		0.00	14.89	0.00	0.00	14.89
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
62727A		0.00	0.00	0.00	4.42	4.42
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
62785A		3.59	2.30	9.10	2.06	17.05
(ROW%)		( 21)	( 13)	( 53)	( 12)	(100)
63003A		0.00	0.00	0.00	3.15	3.15
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
63007A		3.56	5.90	6.50	2.31	18.27
(ROW%)		( 19)	( 32)	( 36)	( 13)	(100)
64715A		0.00	0.00	0.00	37.77	37.77
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
64722A		1.98	0.00	0.00	0.00	1.98
(ROW%)		(100)	( 0)	( 0)	( 0)	(100)
64801A		0.00	0.00	0.00	11.70	11.70
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
ARMY		-----	-----	-----	-----	-----
TOTAL		9.84	27.23	16.41	62.55	116.02
(ROW%)		( 8)	( 23)	( 14)	( 54)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
NAVY		-----	-----	-----	-----	-----
61153N		7.75	2.96	3.38	0.00	14.08
(ROW%)		( 55)	( 21)	( 24)	( 0)	(100)
62131M		0.00	0.00	0.53	0.00	0.53
(ROW%)		( 0)	( 0)	(100)	( 0)	(100)
62233N		1.50	0.00	2.74	2.72	6.95
(ROW%)		( 22)	( 0)	( 39)	( 39)	(100)
62234N		0.00	4.25	0.00	0.00	4.25
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
63701N		0.00	2.54	0.00	0.00	2.54
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
63707N		0.00	0.00	4.12	0.00	4.12
(ROW%)		( 0)	( 0)	(100)	( 0)	(100)
63720N		6.38	0.00	0.00	0.00	6.38
(ROW%)		(100)	( 0)	( 0)	( 0)	(100)
63732M		0.00	0.00	4.08	0.00	4.08
(ROW%)		( 0)	( 0)	(100)	( 0)	(100)
63733N		0.00	0.00	0.00	6.69	6.69
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
63739N		0.00	1.45	0.00	0.00	1.45
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
64703N		0.00	0.00	1.02	0.00	1.02
(ROW%)		( 0)	( 0)	(100)	( 0)	(100)
64715N		0.00	0.00	0.00	17.69	17.69
(ROW%)		( 0)	( 0)	( 0)	(100)	(100)
NAVY TOTAL		-----	-----	-----	-----	-----
(ROW%)		15.62	11.21	15.86	27.09	69.77
		( 22)	( 16)	( 23)	( 39)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
AF		-----	-----	-----	-----	-----
61102F		0.00	7.85	0.91	0.28	9.03
(ROW%)		( 0)	( 87)	( 10)	( 3)	(100)
62202F		0.00	12.42	0.00	0.00	12.42
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
62205F		8.44	5.23	6.00	9.35	29.02
(ROW%)		( 29)	( 18)	( 21)	( 32)	(100)
63106F		0.00	9.62	0.00	0.00	9.62
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
63227F		1.20	0.00	0.74	5.89	7.83
(ROW%)		( 15)	( 0)	( 9)	( 75)	(100)
63231F		0.00	6.60	0.00	0.00	6.60
(ROW%)		( 0)	(100)	( 0)	( 0)	(100)
64227F		50.90	0.00	0.00	13.79	64.69
(ROW%)		( 79)	( 0)	( 0)	( 21)	(100)
AF	TOTAL	-----	-----	-----	-----	-----
(ROW%)		60.55	41.72	7.65	29.31	139.21
		( 43)	( 30)	( 5)	( 21)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
DLA		-----	-----	-----	-----	-----
64722S		8.98	0.00	0.00	0.00	8.98
(ROW%)		(100)	( 0)	( 0)	( 0)	(100)
DLA	TOTAL	-----	-----	-----	-----	-----
(ROW%)		8.98	0.00	0.00	0.00	8.98
		(100)	( 0)	( 0)	( 0)	(100)
DOD TOTAL		-----	-----	-----	-----	-----
(ROW%)		94.98	80.14	39.91	118.95	333.96
		( 28)	( 24)	( 12)	( 36)	(100)

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TABLE II-4

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY

1989 (\$MILLIONS)

BUDGET CATEGORY	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
6.1	7.13	14.68	4.59	1.58	27.98
(ROW%)	( 25)	( 52)	( 16)	( 6)	(100)
6.2	13.07	40.84	15.72	20.09	89.72
(ROW%)	( 15)	( 46)	( 18)	( 22)	(100)
6.3	13.96	33.74	17.67	22.81	88.17
(ROW%)	( 16)	( 38)	( 20)	( 26)	(100)
6.4	52.54	0.00	1.02	74.96	128.52
(ROW%)	( 41)	( 0)	( 1)	( 58)	(100)
TOTAL	86.70	84.26	38.99	119.44	334.39
(ROW%)	( 26)	( 27)	( 12)	( 36)	(100)

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY

1990 (\$MILLIONS)

BUDGET CATEGORY	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
6.1	8.44	14.93	5.08	1.41	29.87
(ROW%)	( 28)	( 50)	( 17)	( 5)	(100)
6.2	13.53	39.09	18.37	18.54	89.53
(ROW%)	( 15)	( 44)	( 21)	( 21)	(100)
6.3	11.14	26.80	15.43	18.90	72.27
(ROW%)	( 15)	( 37)	( 21)	( 26)	(100)
6.4	62.35	0.00	1.52	80.94	144.81
(ROW%)	( 43)	( 0)	( 1)	( 56)	(100)
TOTAL	95.46	80.82	40.40	119.80	336.48
(ROW%)	( 28)	( 24)	( 12)	( 36)	(100)

TABLE II-5

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
		-----	-----	-----	-----	-----
NAVY						
6.1	(ROW%)	6.32 ( 55)	2.41 ( 21)	2.76 ( 24)	0.00 ( 0)	11.50 (100)
6.2	(ROW%)	1.44 ( 13)	4.15 ( 37)	3.10 ( 27)	2.62 ( 23)	11.31 (100)
6.3	(ROW%)	6.15 ( 26)	3.92 ( 17)	7.07 ( 30)	6.45 ( 27)	23.59 (100)
6.4	(ROW%)	0.00 ( 0)	0.00 ( 0)	1.02 ( 5)	18.75 ( 95)	19.77 (100)
NAVY TOTAL		-----	-----	-----	-----	-----
	(ROW%)	13.92 ( 21)	10.48 ( 16)	13.94 ( 21)	27.82 ( 42)	66.16 (100)

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TABLE II-5

MPT PROGRAM FUNDING IN 1989  
BASED ON FY90 PRESIDENT'S BUDGETCONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
		CONGRESSIONAL CATEGORY				TOTAL
BUDGET CATEGORY		ET	HF	MP	ST	
<hr/>						
ARMY						
6.1		0.80	4.33	0.92	1.31	7.37
	(ROW%)	( 11)	( 59)	( 13)	( 18)	(100)
6.2		2.53	19.72	6.28	7.64	36.17
	(ROW%)	( 7)	( 55)	( 17)	( 21)	(100)
6.3		5.99	8.32	9.91	10.36	34.58
	(ROW%)	( 17)	( 24)	( 29)	( 30)	(100)
6.4		6.87	0.00	0.00	28.96	35.84
	(ROW%)	( 19)	( 0)	( 0)	( 81)	(100)
<hr/>						
ARMY	TOTAL	16.19	32.38	17.11	48.28	113.95
	(ROW%)	( 14)	( 28)	( 15)	( 42)	(100)

TABLE II-5

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
AF		-----	-----	-----	-----	-----
6.1	(ROW%)	0.00 ( 0)	7.93 ( 87)	0.91 ( 10)	0.27 ( 3)	9.11 (100)
6.2	(ROW%)	9.10 ( 22)	16.97 ( 40)	6.34 ( 15)	9.84 ( 23)	42.25 (100)
6.3	(ROW%)	1.82 ( 6)	21.50 ( 72)	0.69 ( 2)	6.00 ( 20)	30.01 (100)
6.4	(ROW%)	35.90 ( 57)	0.00 ( 0)	0.00 ( 0)	27.24 ( 43)	63.14 (100)
AF		-----	-----	-----	-----	-----
TOTAL	(ROW%)	46.82 ( 32)	46.40 ( 32)	7.94 ( 5)	43.35 ( 30)	144.50 (100)

TABLE II-5

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
DLA		-----	-----	-----	-----	-----
6.4	(ROW%)	9.77 (100)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	9.77 (100)
DLA	TOTAL (ROW%)	9.77 (100)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	9.77 (100)
DOD	TOTAL (ROW%)	86.70 ( 26)	89.26 ( 27)	38.99 ( 12)	119.44 ( 36)	334.39 (100)

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TABLE II-5

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGETCONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
		-----	-----	-----	-----	-----
ARMY						
6.1	(ROW%)	0.70 ( 10)	4.13 ( 61)	0.80 ( 12)	1.14 ( 17)	6.77 (100)
6.2	(ROW%)	3.59 ( 10)	17.19 ( 47)	9.10 ( 25)	6.48 ( 18)	36.37 (100)
6.3	(ROW%)	3.56 ( 16)	6.60 ( 30)	6.50 ( 29)	5.46 ( 25)	22.12 (100)
6.4	(ROW%)	1.98 ( 4)	0.00 ( 0)	0.00 ( 0)	49.47 ( 96)	51.44 (100)
ARMY TOTAL (ROW%)		9.83 ( 8)	27.92 ( 24)	16.40 ( 14)	62.55 ( 54)	116.70 (100)

TABLE II-5

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGETCONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
		CONGRESSIONAL CATEGORY				TOTAL
BUDGET CATEGORY		ET	HF	MP	ST	
-----						
NAVY						
6.1		7.74	2.96	3.38	0.00	14.08
(ROW%)		( 55)	( 21)	( 24)	( 0)	(100)
6.2		1.50	4.25	3.26	2.71	11.73
(ROW%)		( 13)	( 36)	( 28)	( 23)	(100)
6.3		6.38	3.99	8.19	6.68	25.24
(ROW%)		( 25)	( 16)	( 32)	( 26)	(100)
6.4		0.00	0.00	1.02	17.69	18.71
(ROW%)		( 0)	( 0)	( 5)	( 95)	(100)
-----						
NAVY	TOTAL	15.62	11.20	15.86	27.09	69.75
	(ROW%)	( 22)	( 16)	( 23)	( 39)	(100)

TABLE II-5

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
AF		-----	-----	-----	-----	-----
6.1	(ROW%)	0.00 ( 0)	7.85 ( 87)	0.90 ( 10)	0.27 ( 3)	9.02 (100)
6.2	(ROW%)	8.44 ( 20)	17.65 ( 43)	6.00 ( 14)	9.35 ( 23)	41.43 (100)
6.3	(ROW%)	1.20 ( 5)	16.21 ( 67)	0.74 ( 3)	5.89 ( 25)	24.04 (100)
6.4	(ROW%)	51.40 ( 78)	0.00 ( 0)	0.50 ( 1)	13.79 ( 21)	65.68 (100)
AF		-----	-----	-----	-----	-----
TOTAL	(ROW%)	61.04 ( 44)	41.70 ( 30)	8.14 ( 6)	29.30 ( 21)	140.18 (100)

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TABLE II-5

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
		-----	-----	-----	-----	-----
DLA						
6.4	(ROW%)	8.98 (100)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	8.98 (100)
DLA						
TOTAL	(ROW%)	8.98 (100)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	8.98 (100)
DOD						
TOTAL	(ROW%)	95.46 ( 28)	80.82 ( 24)	40.40 ( 12)	118.93 ( 35)	335.61 (100)

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TABLE II-6

MPT PROGRAM FUNDING IN 1989  
BASED ON FY90 PRESIDENT'S BUDGET

## DOD GOAL BY BUDGET CATEGORY

1989 (\$MILLIONS)

BUDGET CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
6.1 (ROW%)	0.00 ( 0)	0.91 ( 3)	3.56 ( 13)	15.87 ( 57)	0.00 ( 0)	7.63 ( 27)	0.00 ( 0)	27.98 (100)
6.2 (ROW%)	0.00 ( 0)	10.37 ( 12)	0.83 ( 1)	29.15 ( 32)	0.60 ( 1)	24.24 ( 27)	24.53 ( 27)	89.72 (100)
6.3 (ROW%)	3.09 ( 4)	14.57 ( 17)	1.46 ( 2)	32.27 ( 37)	0.00 ( 0)	36.77 ( 42)	0.00 ( 0)	88.17 (100)
6.4 (ROW%)	0.00 ( 0)	1.02 ( 1)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	127.50 ( 99)	0.00 ( 0)	128.52 (100)
TOTAL (ROW%)	3.09 ( 1)	26.88 ( 8)	5.85 ( 2)	77.29 ( 23)	0.60 ( 0)	196.14 ( 59)	24.53 ( 7)	334.39 (100)

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGET

## DOD GOAL BY BUDGET CATEGORY

1990 (\$MILLIONS)

BUDGET CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
6.1 (ROW%)	0.00 ( 0)	0.90 ( 3)	4.08 ( 14)	16.01 ( 54)	0.00 ( 0)	8.88 ( 30)	0.00 ( 0)	29.87 (100)
6.2 (ROW%)	0.00 ( 0)	15.11 ( 17)	0.78 ( 1)	36.30 ( 41)	0.55 ( 1)	25.00 ( 28)	11.79 ( 13)	89.53 (100)
6.3 (ROW%)	4.08 ( 6)	11.35 ( 16)	1.45 ( 2)	25.35 ( 35)	0.00 ( 0)	30.04 ( 42)	0.00 ( 0)	72.27 (100)
6.4 (ROW%)	0.00 ( 0)	1.52 ( 1)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	143.29 ( 99)	0.00 ( 0)	144.81 (100)
TOTAL (ROW%)	4.08 ( 1)	28.89 ( 9)	6.31 ( 2)	77.66 ( 23)	0.55 ( 0)	207.21 ( 62)	11.79 ( 4)	336.46 (100)



TABLE II-7

MPT PROGRAM FUNDING IN 1989  
BASED ON FY90 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY  
WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.80	5.26	0.00	1.31	0.00	7.37
(ROW%)	( 0)	( 0)	( 11)	( 71)	( 0)	( 18)	( 0)	(100)
6.2	0.00	3.91	0.00	10.57	0.00	7.37	14.33	36.18
(ROW%)	( 0)	( 11)	( 0)	( 29)	( 0)	( 20)	( 40)	(100)
6.3	0.00	9.91	0.00	8.32	0.00	16.35	0.00	34.58
(ROW%)	( 0)	( 29)	( 0)	( 24)	( 0)	( 47)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	35.84	0.00	35.84
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
ARMY TOTAL	0.00	13.82	0.80	24.15	0.00	60.87	14.33	113.97
(ROW%)	( 0)	( 12)	( 1)	( 21)	( 0)	( 53)	( 13)	(100)

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TABLE II-7

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	2.76	2.42	0.00	6.32	0.00	11.50
(ROW%)	( 0)	( 0)	( 24)	( 21)	( 0)	( 55)	( 0)	(100)
6.2	0.00	3.10	0.00	3.55	0.60	4.06	0.00	11.31
(ROW%)	( 0)	( 27)	( 0)	( 31)	( 5)	( 36)	( 0)	(100)
6.3	3.09	3.98	1.47	2.46	0.00	12.61	0.00	23.59
(ROW%)	( 13)	( 17)	( 6)	( 10)	( 0)	( 53)	( 0)	(100)
6.4	0.00	1.02	0.00	0.00	0.00	18.76	0.00	19.77
(ROW%)	( 0)	( 5)	( 0)	( 0)	( 0)	( 95)	( 0)	(100)
NAVY TOTAL	3.09	8.09	4.22	8.42	0.60	41.75	0.00	66.18
(ROW%)	( 5)	( 12)	( 6)	( 13)	( 1)	( 63)	( 0)	(100)

TABLE II-7

MPT PROGRAM FUNDING IN 1989  
BASED ON FY90 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY  
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						TOTAL
	1	2	3	4	5	6	VAR	
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.91	0.00	8.20	0.00	0.00	0.00	9.11
(ROW%)	( 0)	( 10)	( 0)	( 90)	( 0)	( 0)	( 0)	(100)
6.2	0.00	3.37	0.83	15.04	0.00	12.81	10.21	42.25
(ROW%)	( 0)	( 8)	( 2)	( 36)	( 0)	( 30)	( 24)	(100)
6.3	0.00	0.69	0.00	21.50	0.00	7.82	0.00	30.01
(ROW%)	( 0)	( 2)	( 0)	( 72)	( 0)	( 26)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	63.15	0.00	63.15
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
AF TOTAL								
(ROW%)	( 0)	( 3)	( 1)	( 31)	( 0)	( 58)	( 7)	(100)

TABLE II-7

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
DLA								
6.4	0.00	0.00	0.00	0.00	0.00	9.77	0.00	9.77
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
	-----	-----	-----	-----	-----	-----	-----	-----
DLA TOTAL	0.00	0.00	0.00	0.00	0.00	9.77	0.00	9.77
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
	-----	-----	-----	-----	-----	-----	-----	-----
DOD TOTAL	3.09	26.88	5.86	77.30	0.60	196.17	24.54	334.44
(ROW%)	( 1)	( 8)	( 2)	( 23)	( 0)	( 59)	( 7)	(100)

II-7-4

TABLE II-7

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

1990 (\$MILLIONS)

DOD ORGANIZATION		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
-----	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.70	4.93	0.00	1.14	0.00	6.77
(ROW%)	( 0)	( 0)	( 10)	( 73)	( 0)	( 17)	( 0)	(100)
6.2	0.00	9.10	0.00	17.19	0.00	10.07	0.00	36.37
(ROW%)	( 0)	( 25)	( 0)	( 47)	( 0)	( 28)	( 0)	(100)
6.3	0.00	6.50	0.00	6.60	0.00	9.02	0.00	22.12
(ROW%)	( 0)	( 29)	( 0)	( 30)	( 0)	( 41)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	51.45	0.00	51.45
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
ARMY TOTAL	0.00	15.60	0.70	28.73	0.00	71.68	0.00	116.71
(ROW%)	( 0)	( 13)	( 1)	( 25)	( 0)	( 61)	( 0)	(100)

II-7-5

TABLE II-7

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY  
WITHIN DOD ORGANIZATION

1990 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	3.38	2.96	0.00	7.74	0.00	14.08
(ROW%)	( 0)	( 0)	( 24)	( 21)	( 0)	( 55)	( 0)	(100)
6.2	0.00	3.26	0.00	3.70	0.55	4.21	0.00	11.73
(ROW%)	( 0)	( 28)	( 0)	( 32)	( 5)	( 36)	( 0)	(100)
6.3	4.08	4.12	1.45	2.54	0.00	13.06	0.00	25.25
(ROW%)	( 16)	( 16)	( 6)	( 10)	( 0)	( 52)	( 0)	(100)
6.4	0.00	1.02	0.00	0.00	0.00	17.69	0.00	18.71
(ROW%)	( 0)	( 5)	( 0)	( 0)	( 0)	( 95)	( 0)	(100)
NAVY TOTAL	4.08	8.40	4.83	9.20	0.55	42.71	0.00	69.77
(ROW%)	( 6)	( 12)	( 7)	( 13)	( 1)	( 61)	( 0)	(100)

II-7-6

TABLE II-7

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.90	0.00	8.12	0.00	0.00	0.00	9.02
(ROW%)	( 0)	( 10)	( 0)	( 90)	( 0)	( 0)	( 0)	(100)
6.2	0.00	2.75	0.78	15.41	0.00	10.72	11.79	41.44
(ROW%)	( 0)	( 7)	( 2)	( 37)	( 0)	( 26)	( 28)	(100)
6.3	0.00	0.74	0.00	16.21	0.00	7.09	0.00	24.05
(ROW%)	( 0)	( 3)	( 0)	( 67)	( 0)	( 29)	( 0)	(100)
6.4	0.00	0.50	0.00	0.00	0.00	65.19	0.00	65.69
(ROW%)	( 0)	( 1)	( 0)	( 0)	( 0)	( 99)	( 0)	(100)
AF TOTAL	0.00	4.89	0.78	39.74	0.00	83.00	11.79	140.20
(ROW%)	( 0)	( 3)	( 1)	( 28)	( 0)	( 59)	( 8)	(100)

II-7-7

TABLE II-7

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
DLA								
6.4	0.00	0.00	0.00	0.00	0.00	8.98	0.00	8.98
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
DLA TOTAL								
	0.00	0.00	0.00	0.00	0.00	8.98	0.00	8.98
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
DOD TOTAL								
	4.08	28.89	6.31	77.68	0.55	206.36	11.79	335.65
(ROW%)	( 1)	( 9)	( 2)	(23)	( 0)	( 61)	( 4)	(100)

II-7-8



TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.80
(ROW%)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	1.52	1.01	2.53
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 60)	( 40)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	5.99	0.00	5.99
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	6.87	0.00	6.87
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
ARMY TOTAL	0.00	0.00	0.80	0.00	0.00	14.38	1.01	16.19
(ROW%)	( 0)	( 0)	( 5)	( 0)	( 0)	( 89)	( 6)	(100)

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	0.00	0.00	0.00	6.32	0.00	6.32
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	1.44	0.00	1.44
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.15	0.00	6.15
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.00	0.00	13.92	0.00	13.92
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)

II-8-2

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.2	0.00	0.00	0.00	0.00	0.00	6.14	2.96	9.10
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 67)	( 33)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	1.82	0.00	1.82
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	35.90	0.00	35.90
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
AF TOTAL	0.00	0.00	0.00	0.00	0.00	43.86	2.96	46.82
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 94)	( 6)	(100)

II-8-3

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY - ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL						VAR	TOTAL
BUDGET CATEGORY	1	2	3	4	5	6		
	-----	-----	-----	-----	-----	-----	-----	-----
DLA								
6.4	0.00	0.00	0.00	0.00	0.00	9.77	0.00	9.77
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
DLA TOTAL	0.00	0.00	0.00	0.00	0.00	9.77	0.00	9.77
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
DOD TOTAL	0.00	0.00	0.80	0.00	0.00	81.94	3.97	86.71
(ROW%)	( 0)	( 0)	( 1)	( 0)	( 0)	( 94)	( 5)	(100)

II-8-4

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	4.33	0.00	0.00	0.00	4.33
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	10.57	0.00	0.00	9.16	19.72
(ROW%)	( 0)	( 0)	( 0)	( 54)	( 0)	( 0)	( 46)	(100)
6.3	0.00	0.00	0.00	8.32	0.00	0.00	0.00	8.32
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
ARMY TOTAL	0.00	0.00	0.00	23.22	0.00	0.00	9.16	32.38
(ROW%)	( 0)	( 0)	( 0)	( 72)	( 0)	( 0)	( 28)	(100)

II-8-5

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	0.00	2.42	0.00	0.00	0.00	2.42
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	3.55	0.60	0.00	0.00	4.15
(ROW%)	( 0)	( 0)	( 0)	( 86)	(14)	( 0)	( 0)	(100)
6.3	0.00	0.00	1.47	2.46	0.00	0.00	0.00	3.92
(ROW%)	( 0)	( 0)	( 37)	( 63)	( 0)	( 0)	( 0)	(100)
NAVY TOTAL	0.00	0.00	1.47	8.42	0.60	0.00	0.00	10.49
(ROW%)	( 0)	( 0)	( 14)	( 80)	( 6)	( 0)	( 0)	(100)

II-8-6

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.00	0.00	7.93	0.00	0.00	0.00	7.93
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	15.04	0.00	0.00	1.94	16.97
(ROW%)	( 0)	( 0)	( 0)	( 89)	( 0)	( 0)	( 11)	(100)
6.3	0.00	0.00	0.00	21.50	0.00	0.00	0.00	21.50
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
AF TOTAL								
	0.00	0.00	0.00	44.46	0.00	0.00	1.94	46.40
(ROW%)	( 0)	( 0)	( 0)	( 96)	( 0)	( 0)	( 4)	(100)
DOD TOTAL								
	0.00	0.00	1.47	76.11	0.60	0.00	11.10	89.27
(ROW%)	( 0)	( 0)	( 2)	( 85)	( 1)	( 0)	( 12)	(100)

11-8-7

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = MP

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	0.92	0.00	0.00	0.00	0.92
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	3.91	0.00	0.00	0.00	0.00	2.37	6.28
(ROW%)	( 0)	( 62)	( 0)	( 0)	( 0)	( 0)	( 38)	(100)
6.3	0.00	9.91	0.00	0.00	0.00	0.00	0.00	9.91
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
ARMY TOTAL	0.00	13.82	0.00	0.92	0.00	0.00	2.37	17.11
(ROW%)	( 0)	( 81)	( 0)	( 5)	( 0)	( 0)	( 14)	(100)

II-8-8



TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = MP

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	2.76	0.00	0.00	0.00	0.00	2.76
(ROW%)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	(100)
6.2	0.00	3.10	0.00	0.00	0.00	0.00	0.00	3.10
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.3	3.09	3.98	0.00	0.00	0.00	0.00	0.00	7.07
(ROW%)	( 44)	( 56)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.4	0.00	1.02	0.00	0.00	0.00	0.00	0.00	1.02
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
NAVY TOTAL	3.09	8.09	2.76	0.00	0.00	0.00	0.00	13.94
(ROW%)	( 22)	( 58)	( 20)	( 0)	( 0)	( 0)	( 0)	(100)

II-8-9

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = MP

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.91
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.2	0.00	3.37	0.83	0.00	0.00	0.00	2.14	6.34
(ROW%)	( 0)	( 53)	( 13)	( 0)	( 0)	( 0)	( 34)	(100)
6.3	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.69
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
AF TOTAL	0.00	4.97	0.83	0.00	0.00	0.00	2.14	7.95
(ROW%)	( 0)	( 63)	( 10)	( 0)	( 0)	( 0)	( 27)	(100)
DOD TOTAL	3.09	26.88	3.59	0.92	0.00	0.00	4.52	39.00
(ROW%)	( 8)	( 69)	( 9)	( 2)	( 0)	( 0)	( 12)	(100)

II-8-10

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ST

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	0.00	0.00	1.31	0.00	1.31
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	5.85	1.80	7.64
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 77)	( 23)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	10.36	0.00	10.36
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	28.97	0.00	28.97
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
ARMY TOTAL	0.00	0.00	0.00	0.00	0.00	46.49	1.80	48.28
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 96)	( 4)	(100)

II-8-11

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ST

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY	DOD GOAL							
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.2	0.00	0.00	0.00	0.00	0.00	2.62	0.00	2.62
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.45	0.00	6.45
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	18.76	0.00	18.76
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.00	0.00	27.82	0.00	27.82
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)

II-8-12

TABLE II-8

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ST

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL						VAR	TOTAL
BUDGET CATEGORY	1	2	3	4	5	6		
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.27
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	6.67	3.16	9.84
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 68)	( 32)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.00	0.00	6.00
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	27.25	0.00	27.25
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
AF TOTAL	0.00	0.00	0.00	0.27	0.00	39.92	3.16	43.36
(ROW%)	( 0)	( 0)	( 0)	( 1)	( 0)	( 92)	( 7)	(100)
DOD TOTAL	0.00	0.00	0.00	0.27	0.00	114.23	4.96	119.46
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 96)	( 4)	(100)

II-8-13

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY - ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

1990 (\$MILLIONS)

DOD ORGANIZATION		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
-----	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.70
(ROW%)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	3.59	0.00	3.59
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	3.56	0.00	3.56
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	1.98	0.00	1.98
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
ARMY TOTAL								
(ROW%)	0.00	0.00	0.70	0.00	0.00	9.13	0.00	9.83
	( 0)	( 0)	( 7)	( 0)	( 0)	( 93)	( 0)	(100)

II-8-14

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	0.00	0.00	0.00	7.74	0.00	7.74
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	1.50	0.00	1.50
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.38	0.00	6.38
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.00	0.00	15.62	0.00	15.62
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)

II-8-15

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.2	0.00	0.00	0.00	0.00	0.00	5.02	3.42	8.44
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 59)	( 41)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	1.20	0.00	1.20
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	51.40	0.00	51.40
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
AF TOTAL	0.00	0.00	0.00	0.00	0.00	57.62	3.42	61.04
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 94)	( 6)	(100)

II-8-16



TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL					VAR	TOTAL
	1	2	3	4	5	6		
DLA								
6.4 (ROW%)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	8.98 (100)	0.00 ( 0)	8.98 (100)
DLA TOTAL (ROW%)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	0.00 ( 0)	8.98 (100)	0.00 ( 0)	8.98 (100)
DOD TOTAL (ROW%)	0.00 ( 0)	0.00 ( 0)	0.70 ( 1)	0.00 ( 0)	0.00 ( 0)	91.35 ( 96)	3.42 ( 4)	95.47 (100)

II-8-17

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	4.13	0.00	0.00	0.00	4.13
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	17.19	0.00	0.00	0.00	17.19
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.3	0.00	0.00	0.00	6.60	0.00	0.00	0.00	6.60
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
ARMY TOTAL	0.00	0.00	0.00	27.92	0.00	0.00	0.00	27.92
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)

11-8-18

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	0.00	2.96	0.00	0.00	0.00	2.96
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	3.70	0.55	0.00	0.00	4.25
(ROW%)	( 0)	( 0)	( 0)	( 87)	(13)	( 0)	( 0)	(100)
6.3	0.00	0.00	1.45	2.54	0.00	0.00	0.00	3.99
(ROW%)	( 0)	( 0)	( 36)	( 64)	( 0)	( 0)	( 0)	(100)
NAVY TOTAL	0.00	0.00	1.45	9.20	0.55	0.00	0.00	11.20
(ROW%)	( 0)	( 0)	( 13)	( 82)	( 5)	( 0)	( 0)	(100)

II-8-19

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.00	0.00	7.85	0.00	0.00	0.00	7.85
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	15.41	0.00	0.00	2.24	17.65
(ROW%)	( 0)	( 0)	( 0)	( 87)	( 0)	( 0)	( 13)	(100)
6.3	0.00	0.00	0.00	16.21	0.00	0.00	0.00	16.21
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
AF TOTAL								
(ROW%)	0.00	0.00	0.00	39.47	0.00	0.00	2.24	41.71
	( 0)	( 0)	( 0)	( 95)	( 0)	( 0)	( 5)	(100)
DOD TOTAL								
(ROW%)	0.00	0.00	1.45	76.60	0.55	0.00	2.24	80.84
	( 0)	( 0)	( 2)	( 95)	( 1)	( 0)	( 3)	(100)

II-8-20

TABLE 8

MPI PROGRAM FUNDING IN 1990  
 BASED ON 1990 PRESIDENTIAL BUDGET  
 FOR CONGRESSIONAL CATEGORY - MI

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.80
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	9.10	0.00	0.00	0.00	0.00	0.00	9.10
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.3	0.00	6.50	0.00	0.00	0.00	0.00	0.00	6.50
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
ARMY TOTAL	0.00	15.60	0.00	0.80	0.00	0.00	0.00	16.40
(ROW%)	( 0)	( 95)	( 0)	( 5)	( 0)	( 0)	( 0)	(100)

11-8-21

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = MP

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	3.38	0.00	0.00	0.00	0.00	3.38
(ROW%)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	(100)
6.2	0.00	3.26	0.00	0.00	0.00	0.00	0.00	3.26
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.3	4.08	4.12	0.00	0.00	0.00	0.00	0.00	8.19
(ROW%)	( 50)	( 50)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.4	0.00	1.02	0.00	0.00	0.00	0.00	0.00	1.02
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
NAVY TOTAL	4.08	8.40	3.38	0.00	0.00	0.00	0.00	15.86
(ROW%)	( 26)	( 53)	( 21)	( 0)	( 0)	( 0)	( 0)	(100)

II-8-22

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = MP

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY	DOD GOAL							TOTAL
	1	2	3	4	5	6	VAR	
AF								
6.1	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.90
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.2	0.00	2.75	0.78	0.00	0.00	0.00	2.48	6.00
(ROW%)	( 0)	( 46)	( 13)	( 0)	( 0)	( 0)	( 41)	(100)
6.3	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.74
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
6.4	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50
(ROW%)	( 0)	(100)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)
AF TOTAL								
(ROW%)	0.00	4.89	0.78	0.00	0.00	0.00	2.48	8.15
	( 0)	( 60)	( 10)	( 0)	( 0)	( 0)	( 30)	(100)
DOD TOTAL								
(ROW%)	4.08	28.89	4.16	0.80	0.00	0.00	2.48	40.41
	( 10)	( 71)	( 10)	( 2)	( 0)	( 0)	( 6)	(100)

II-8-23

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY - ST

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
ARMY								
6.1	0.00	0.00	0.00	0.00	0.00	1.14	0.00	1.14
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	6.48	0.00	6.48
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	5.46	0.00	5.46
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	49.47	0.00	49.47
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
ARMY TOTAL	0.00	0.00	0.00	0.00	0.00	62.55	0.00	62.55
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)

II-8-24



TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY = ST

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.2	0.00	0.00	0.00	0.00	0.00	2.72	0.00	2.72
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.69	0.00	6.69
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	17.69	0.00	17.69
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.00	0.00	27.09	0.00	27.09
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)

II-8-25

TABLE II-8

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR CONGRESSIONAL CATEGORY - ST

DOD GOAL BY BUDGET CATEGORY  
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1990 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.27
(ROW%)	( 0)	( 0)	( 0)	(100)	( 0)	( 0)	( 0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	5.70	3.65	9.35
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 61)	( 39)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	5.89	0.00	5.89
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	13.79	0.00	13.79
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
AF TOTAL								
(ROW%)	0.00	0.00	0.00	0.27	0.00	25.38	3.65	29.30
	( 0)	( 0)	( 0)	( 1)	( 0)	( 87)	( 12)	(100)
DOD TOTAL								
(ROW%)	0.00	0.00	0.00	0.27	0.00	115.02	3.65	118.94
	( 0)	( 0)	( 0)	( 0)	( 0)	( 97)	( 3)	(100)

II-8-26

TABLE 11-9  
MPT PROGRAM FUNDING IN 1989  
BASED ON FY90 PRESIDENT'S BUDGET  
DOD GOAL BY CONGRESSIONAL CATEGORY  
1989 (\$MILLIONS)

CONGRESSIONAL CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
ET	0.00	0.00	0.80	0.00	0.00	81.93	3.97	86.70
(ROW%)	( 0)	( 0)	( 1)	( 0)	( 0)	( 94)	( 5)	(100)
HF	0.00	0.00	1.46	76.10	0.60	0.00	11.09	89.26
(ROW%)	( 0)	( 0)	( 2)	( 85)	( 1)	( 0)	( 12)	(100)
MP	3.09	26.88	3.59	0.92	0.00	0.00	4.51	38.99
(ROW%)	( 8)	( 69)	( 9)	( 2)	( 0)	( 0)	( 12)	(100)
ST	0.00	0.00	0.00	0.27	0.00	114.21	4.96	119.44
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 96)	( 4)	(100)
TOTAL	3.09	26.88	5.85	77.29	0.60	196.14	24.53	334.39
(ROW%)	( 1)	( 8)	( 2)	( 23)	( 0)	( 59)	( 7)	(100)

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGET  
DOD GOAL BY CONGRESSIONAL CATEGORY  
1990 (\$MILLIONS)

CONGRESSIONAL CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
ET	0.00	0.00	0.70	0.00	0.00	91.34	3.42	95.46
(ROW%)	( 0)	( 0)	( 1)	( 0)	( 0)	( 96)	( 4)	(100)
HF	0.00	0.00	1.45	76.59	0.55	0.00	2.24	80.82
(ROW%)	( 0)	( 0)	( 2)	( 95)	( 1)	( 0)	( 3)	(100)
MP	4.08	28.89	4.16	0.80	0.00	0.00	2.47	40.40
(ROW%)	( 10)	( 72)	( 10)	( 2)	( 0)	( 0)	( 6)	(100)
ST	0.00	0.00	0.00	0.27	0.00	115.87	3.65	119.80
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	( 97)	( 3)	(100)
TOTAL	4.08	28.89	6.31	77.66	0.55	207.21	11.78	336.48
(ROW%)	( 1)	( 9)	( 2)	( 23)	( 0)	( 62)	( 4)	(100)

TABLE II-10

MPT PROGRAM FUNDING IN 1989  
BASED ON FY90 PRESIDENT'S BUDGET

## DOD GOAL BY DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
ARMY	0.00	13.82	0.80	24.14	0.00	60.86	14.33	113.95
(ROW%)	( 0)	( 12)	( 1)	( 21)	( 0)	( 53)	( 13)	(100)
NAVY	3.09	8.09	4.22	8.42	0.60	41.74	0.00	66.16
(ROW%)	( 5)	( 12)	( 6)	( 13)	( 1)	( 63)	( 0)	(100)
AF	0.00	4.97	0.83	44.73	0.00	83.77	10.21	144.50
(ROW%)	( 0)	( 3)	( 1)	( 31)	( 0)	( 58)	( 7)	(100)
DLA	0.00	0.00	0.00	0.00	0.00	9.77	0.00	9.77
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
TOTAL	3.09	26.88	5.85	77.29	0.60	196.14	24.53	334.39
(ROW%)	( 1)	( 8)	( 2)	( 23)	( 0)	( 59)	( 7)	(100)

MPT PROGRAM FUNDING IN 1990  
BASED ON FY90 PRESIDENT'S BUDGET

## DOD GOAL BY DOD ORGANIZATION

1990 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
ARMY	0.00	15.60	0.70	28.72	0.00	72.54	0.00	117.57
(ROW%)	( 0)	( 13)	( 1)	( 24)	( 0)	( 62)	( 0)	(100)
NAVY	4.08	8.40	4.82	9.20	0.55	42.70	0.00	69.75
(ROW%)	( 6)	( 12)	( 7)	( 13)	( 1)	( 61)	( 0)	(100)
AF	0.00	4.89	0.78	39.74	0.00	82.99	11.79	140.18
(ROW%)	( 0)	( 3)	( 1)	( 28)	( 0)	( 59)	( 8)	(100)
DLA	0.00	0.00	0.00	0.00	0.00	8.98	0.00	8.98
(ROW%)	( 0)	( 0)	( 0)	( 0)	( 0)	(100)	( 0)	(100)
TOTAL	4.08	28.89	6.31	77.66	0.55	207.21	11.79	336.48
(ROW%)	( 1)	( 9)	( 2)	( 23)	( 0)	( 62)	( 4)	(100)

TABLE II-11

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR BUDGET CATEGORY = 6.1,6.2

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
ARMY (ROW%)	3.33 ( 8)	24.06 ( 55)	7.20 ( 17)	8.95 ( 21)	43.54 (100)
NAVY (ROW%)	7.77 ( 34)	6.57 ( 29)	5.85 ( 26)	2.62 ( 11)	22.80 (100)
AF (ROW%)	9.10 ( 18)	24.90 ( 48)	7.25 ( 14)	10.11 ( 20)	51.36 (100)
TOTAL (ROW%)	20.20 ( 17)	55.52 ( 47)	20.31 ( 17)	21.68 ( 0)	117.70 (100)

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR BUDGET CATEGORY = 6.1,6.2

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1990 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
ARMY (ROW%)	4.29 ( 10)	21.32 ( 49)	9.91 ( 23)	7.62 ( 18)	43.14 (100)
NAVY (ROW%)	9.24 ( 36)	7.21 ( 28)	6.64 ( 26)	2.71 ( 11)	25.80 (100)
AF (ROW%)	8.44 ( 17)	25.49 ( 51)	6.90 ( 14)	9.62 ( 19)	50.46 (100)
TOTAL (ROW%)	21.97 ( 18)	54.02 ( 45)	23.45 ( 20)	19.96 ( 0)	119.40 (100)

TABLE II-12

MPT PROGRAM FUNDING IN 1989  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR BUDGET CATEGORY = 6.1,6.2,6.3

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY	9.32	32.38	17.11	19.31	78.12
(ROW%)	( 12)	( 41)	( 22)	( 25)	(100)
NAVY	13.92	10.48	12.92	9.07	46.39
(ROW%)	( 30)	( 23)	( 28)	( 20)	(100)
AF	10.92	46.40	7.94	16.10	81.36
(ROW%)	( 13)	( 57)	( 10)	( 20)	(100)
TOTAL	-----	-----	-----	-----	-----
(ROW%)	34.16	89.26	37.97	44.48	205.87
	( 17)	( 43)	( 18)	( 22)	(100)

MPT PROGRAM FUNDING IN 1990  
 BASED ON FY90 PRESIDENT'S BUDGET  
 FOR BUDGET CATEGORY = 6.1,6.2,6.3

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1990 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY	7.85	27.92	16.40	13.95	66.13
(ROW%)	( 12)	( 42)	( 25)	( 21)	(100)
NAVY	15.62	11.20	14.83	9.40	51.05
(ROW%)	( 31)	( 22)	( 29)	( 18)	(100)
AF	9.64	41.70	7.64	15.51	74.50
(ROW%)	( 13)	( 56)	( 10)	( 21)	(100)
TOTAL	-----	-----	-----	-----	-----
(ROW%)	33.11	80.82	38.88	38.86	191.67
	( 17)	( 42)	( 20)	( 20)	(100)

III. PROGRAM ELEMENT AND PROJECT SYNOPSES

MANPOWER, PERSONNEL AND TRAINING  
PROGRAM FUNDING BY SERVICE - JAN 1989

PE	TITLE	(\$ MILLIONS)			
		FY87	FY88	FY89	FY90
-----					
AIR FORCE					
-----					
61102F	DEFENSE RESEARCH SCIENCES	8.5	9.0	9.2	9.1
62202F	HUMAN SYSTEMS TECHNOLOGY	10.9	12.2	11.4	12.5
62205F	PERSONNEL, TRAINING, AND SIMULATION	32.5	30.9	30.9	29.1
62703F	PERSONNEL UTILIZATION TECHNOLOGY	0.0	0.0	0.0	0.0
63106F	LOGISTICS SYSTEMS TECHNOLOGY	10.8	8.4	15.0	9.7
63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY	7.5	7.8	8.6	7.9
63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY	8.2	6.3	6.6	6.6
63365F	SPACE BIOTECHNOLOGY	0.0	0.0	0.0	0.0
63704F	MANPOWER AND PERSONNEL SYSTEMS TECHNOLOGY	0.0	0.0	0.0	0.0
63751F	TRAINING SYSTEMS TECHNOLOGY	0.1	0.1	0.1	0.1
64227F	FLIGHT SIMULATOR DEVELOPMENT	92.8	50.6	63.2	65.2
64243F	MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT	0.0	0.1	0.1	0.5
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SURTOTAL - AIR FORCE:		170.9	124.7	144.5	140.2
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DLA					
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64722S	JOINT SERVICES MANPOWER AND TRAINING SYSTEMS	0.0	7.2	9.8	9.0
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SUBTOTAL - DLA :		0.0	7.2	9.8	9.0
-----					
TOTAL:		377.8	305.1	334.4	336.5



MANPOWER, PERSONNEL AND TRAINING  
PROGRAM FUNDING BY SERVICE - JAN 1989

PE	TITLE	(\$ MILLIONS)				
		FY87	FY88	FY89	FY90	
-----						
ARMY						
----						
61102A	DEFENSE RESEARCH SCIENCES	6.5	7.0	7.4	6.8	
62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY	21.2	15.6	15.1	14.9	
62717A	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION	0.0	0.0	0.0	0.0	
62722A	MANPOWER, PERSONNEL AND TRAINING	0.0	0.0	0.0	0.0	
62727A	NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY	3.7	3.6	3.5	4.5	
62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY	15.4	15.1	17.8	17.1	
63003A	AVIATION ADVANCED TECHNOLOGY	13.0	4.6	5.4	4.1	
63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY	28.8	28.5	29.2	19.0	
63216A	SYNTHETIC FLIGHT SIMULATOR DEVELOPMENT	0.0	0.0	0.0	0.0	
63731A	MANPOWER AND PERSONNEL	0.0	0.0	0.0	0.0	
63736A	HUMAN FACTORS ENGINEERING APPLICATIONS	0.0	0.0	0.0	0.0	
63738A	NON-SYSTEM TRAINING DEVICES (NSTD) ADVANCED DEVELOPMENT	3.4	0.0	0.0	0.0	
63739A	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS	0.0	0.0	0.0	0.0	
63743A	EDUCATION AND TRAINING	0.0	0.0	0.0	0.0	
63744A	TRAINING SIMULATION	0.0	0.0	0.0	0.0	
64217A	SYNTHETIC FLIGHT TRAINING SYSTEMS	0.0	0.0	0.0	0.0	
64715A	NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT	35.3	27.5	21.8	37.8	
64722A	EDUCATION AND TRAINING SYSTEMS DEVELOPMENT	4.2	5.4	6.9	2.0	
64801A	AVIATION ENGINEERING DEVELOPMENT	7.3	5.8	7.2	11.7	
		-----				
SUBTOTAL - ARMY		:	138.3	112.7	114.0	117.6
NAVY						
----						
61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES	12.0	10.1	11.5	14.1	
62131M	MARINE CORPS LANDING FORCE TECHNOLOGY	0.7	0.5	0.5	0.6	
62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA	8.7	6.6	6.8	7.0	
62234N	SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA	3.5	3.7	4.2	4.3	
62744N	MARINE CORPS AIR-GROUND TECHNOLOGY	0.0	0.0	0.0	0.0	
62757N	HUMAN FACTORS AND SIMULATION TECHNOLOGY	0.0	0.0	0.0	0.0	
62763N	PERSONNEL AND TRAINING TECHNOLOGY	0.0	0.0	0.0	0.0	
63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT	2.5	2.6	2.5	2.6	
63707N	MANPOWER AND PERSONNEL SYSTEMS	2.9	3.1	4.0	4.2	
63710N	MAN-MACHINE TECHNOLOGY	0.0	0.0	0.0	0.0	
63720N	EDUCATION AND TRAINING	4.8	5.1	6.2	6.4	
63727N	ADVANCED TECHNOLOGY FOR LOGISTICS INFORMATION	0.0	0.0	0.0	0.0	
63732M	ADVANCED MANPOWER/TRAINING SYSTEMS	2.4	2.2	3.1	4.1	
63733N	SIMULATION AND TRAINING DEVICE TECHNOLOGY	8.4	8.3	6.5	6.7	
63739N	NAVY LOGISTICS PRODUCTIVITY	0.1	1.0	1.5	1.5	
64703N	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS	1.0	1.0	1.1	1.1	
64709N	JOINT SERVICE MANPOWER/PERSONNEL PROTOTYPES	0.0	0.0	0.0	0.0	
64714N	AIR WARFARE TRAINING DEVICES	0.1	0.0	0.0	0.0	
64715N	SURFACE WARFARE TRAINING	22.4	16.9	18.8	17.7	
64716N	SUBMARINE WARFARE TRAINING DEVICES	0.0	0.0	0.0	0.0	
		-----				
SUBTOTAL - NAVY		:	68.6	60.6	66.2	69.8

TRAINING AND PERSONNEL TECHNOLOGY  
RESEARCH ORGANIZATIONS

ARMY

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AVRADCOM	Army Aviation Research and Development Center
ARI	Army Research Institute
HEL	Army Human Engineering Laboratory
PMTRADE	Project Manager for Training Devices

NAVY

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HQMC	Headquarters, US Marine Corps
NADC	Naval Air Development Center
NAMRL	Naval Aerospace Medical Research Laboratory
NAVAIR	Naval Air Systems Command
NAVELEX	Naval Electronic Systems Command
NAVSEA	Naval Sea Systems Command
NOSC	Naval Ocean Systems Center
NPRDC	Navy Personnel Research and Development Center
NSRDC	Naval Ship Research and Development Center
NSWC	Naval Surface Weapons Center
NTSC	Naval Training Systems Center
ONR	Office of Naval Research

AIR FORCE

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AAMRL	Armstrong Aerospace Medical Research Laboratory
AFHRL	Air Force Human Resources Laboratory
AFOSR	Air Force Office of Scientific Research
AMD	Aerospace Medical Division
TS SPO	Deputy for Training Systems

DLA

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DLA	Defense Logistics Agency
TPDC	Training Performance Data Center

### III.A. ARMY PROGRAM ELEMENT AND PROJECT SYNOPSES

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PE	TITLE	PAGE
61102A	DEFENSE RESEARCH SCIENCES	III-A-1
62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY	III-A-11
62727A	NON-SYSTEM TRAINING DEVICES TECHNOLOGY	III-A-16
62785A	MANPOWER, PERSONNEL AND TRAINING TECHNOLOGY	III-A-18
63003A	AVAIATION ADVANCED TECHNOLOGY	III-A-28
63007A	HUMAN, FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY	III-A-33
64715A	NON-SYSTEM TRAINING DEVICES ENGINEERING DEVELOPMENT	III-A-41
64722A	EDUCATION AND TRAINING SYSTEMS DEVELOPMENT	III-A-46
64801A	AVIATION ENGINEERING DEVELOPMENT	III-A-50

Table III-A-1: Listing of Projects - Lists projects for each ARMY program element. Lists contain performing organization, funding, Congressional Category and goal information.

III-A-i

## PROGRAM ELEMENT OVERVIEW

PE: 61102A                      DEFENSE RESEARCH SCIENCES

CONGRESSIONAL CATEGORY:      EDUCATION & TRAINING  
                                 HUMAN FACTORS  
                                 MANPOWER & PERSONNEL  
                                 SIMULATION & TRAINING DEVICES

DoD ORGANIZATION:            ARMY

FUNDING:                      FY89 \$ 7.4M (FY90 PRESIDENT'S BUDGET)  
                                 FY90 \$ 6.8M (FY90 PRESIDENT'S BUDGET)

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PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to produce data, concepts, and technology needed to support applied R&D advances in MPT.

To accomplish this objective, the research will: (a) capitalize on relevant new behavioral technological opportunities that have potential for increasing future operational Army personnel performance, (b) involve innovative civilian sector (university and industry) scientists in the discovery and adaptation of new technology to Army needs, and (c) form the behavioral science base to build new technologies for soldier and system effectiveness.

This effort includes the theoretical and experimental research to provide techniques to develop skills for the individual soldier, to improve soldier interactions with equipment, and to improve the soldier's performance in the combat environment.

This program sustains the U.S. Army science and engineering base required to exploit new opportunities in rapidly advancing technological fields. The program supports theoretical and experimental research in the physical, mathematical, biological, environmental, terrestrial and behavioral sciences. This research is focused on the Army's key goals for effectiveness in the airland battle environment and the Army 21 concept to provide a lethal, integrated, supportable, highly mobile force with enhanced soldier effectiveness. Research areas are determined and prioritized in order to meet Army needs as stated in mission area analyses and in Army 21, and to exploit scientific opportunities.

The work is performed by 33 Army laboratories and activities and by academic institutions, not-for-profit organizations, and industrial laboratories through contracts and grants.

## RELATED ACTIVITIES:

Not applicable.

## PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Program Element is a behavioral science base on which to build new technologies to improve the effectiveness of soldiers and systems.

This basic research's contribution to the Army lies substantially in seeding new exploratory and advanced development to enhance soldier performance and behavior, and in enlisting civilian scientific skills and facilities (university and industry) to cooperatively address Army needs to explore and transition new technologies into application to solve Army personnel problems.

**FUTURE DIRECTIONS:**

In FY91, for the Human Engineering Project, it is planned to: (a) expand research efforts in visual detection and recognition to further develop the visual application to aided target recognition systems, and (b) based on previous intelligibility studies, develop a metric to be used in evaluating the effect of speech intelligibility on crew performance for application to combined arms operations.

In FY91, for the Personnel Performance and Training Project, it is planned to: (a) identify variables and mechanisms that determine individual-organizational relationships and organizational productivity, and (b) determine factors influencing how groups identify and define decision situations and make decisions in natural environments.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: B74A	HUMAN ENGINEERING	\$ 3.1M	\$ 3.1M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY HUMAN ENGINEERING LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to support human factors engineering by generating soldier performance data to develop better engineering design principles.

New information is needed on the capabilities and limitations of men and women so predictions can be made about soldier performance when using military equipment under all field conditions in all environments. Findings are used in the design of displays, controls, workspaces, and complex equipment such as command and control facilities. This effort will support fundamental research to stimulate scientific progress and novel human engineering concepts to provide options for future Army technology and to ensure against surprises in the operational capability of potential adversaries. The use of scientific results in Army applications, in exploiting novel concepts, and in efficiently transferring programs into exploratory development programs should maintain or increase the U.S. lead in critical areas of military technology.

In FY89, it is planned to: (a) refine methodology and experimental techniques to better quantify and further isolate those visual features that lead to rapid detection and recognition of friendly or threat combat vehicle systems; the data will contribute to the design of future combat vehicles and aided target recognition systems, (b) establish a database, in conjunction with the Armor School and Communications-Electronics Command (CECOM), on the relationship between speech and intelligibility and armor crew performance; the data will contribute to the development of a standard intelligibility level measure for the application to the design of future combat vehicles, and (c) complete the data analysis and publish the initial findings on the physiological, psychological, and biomedical effects of stress on soldier marksmanship performance as related to future small arms design.

Plans for FY90 are to: (a) develop and provide to Tank Automotive Command preliminary combat vehicle design information with respect to non-detectability of U.S. armor vehicles and systems, (b) expand communication studies to establish the relationship between speech intelligibility and aviation combat operations; evaluations of both armor and aviation intelligibility levels will be conducted to determine the relationship between levels of speech intelligibility and crew combat mission performance, and (c) develop a metric to measure hit probability and soldier marksmanship performance when subjected to "combat-like" stresses for transition to Army analysis and design communities; data will be provided for the Armament RDE Center (ARDEC) as well as the Infantry School for incorporation into the Advanced Combat Rifle Technology assessment.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) the enhancement of the soldier-machine interface, to increase the soldier's ability to operate and maintain Army materiel, and (b) reduction of the manpower required to

accomplish Army missions.

By fully understanding the soldier's physical and mental capabilities and limitations, designers will be able to develop equipment that achieves the optimum man-machine interface and increases battlefield effectiveness. This would greatly improve operational readiness, combat effectiveness and sustainability in all mission crews.

In FY88, specific accomplishments included: (a) completing an initial research investigation with soldiers regarding visual detection and recognition of armored combat vehicles when viewed through sensor systems; early data analysis indicates that there exist specific vehicle design features that are easily recognizable in both friendly and threat vehicle systems; the data will influence the design of less-detectable U.S. Army future combat vehicles and possible aid in designing aided target recognition (ATR) systems, (b) initiating a research program to quantify the relationship between speech intelligibility and armor vehicle crew performance when engaged in highly competitive firing scenarios; the data will contribute to the design requirements for future combat vehicles, and (c) conducting a major field evaluation with soldiers on the physiological, psychological, and biomedical effects of stress on soldier marksmanship performance as related to small arms design; the experimental design also evaluated the effects of semi-automatic fire vs. salvo fire with respect to hit probability and logistic considerations.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: B74F-ET	UNIT PERFORMANCE	\$ 0.8M	\$ 0.7M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Task is to develop methods and systems which will provide more rapid, efficient measures for training units.

Most Army training focuses on the individual, whether enlisted or officer; however, the Army typically fights and operates in units. As few methods exist for characterizing the adequacy group performance or for measuring improvement in group functions as a result of group or individual training, research is needed on tasks where responsibility is distributed.

Basic to functioning of the Army is the structure of the organization, and the need to know more about how people behave in organizations. Another focus is to find improved methods to measure leadership, cohesion, organizational dynamics, and job satisfaction. Additionally, the Army needs a model of unit performance to help guide researchers in the most productive areas of research on unit performance.

In FY89, it is planned to explore the contributions of hypermedia systems to theories of learning in complex domains, such as foreign languages.

In FY90, it is planned to develop a theory of cooperative learning by groups in order to analyze and cope with the consequences of personnel instability.

## PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) training cost reductions, (b) more effective unit training and performance, and (c) provision of a force multiplier effect.



## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: B74F-HF	DESIGNING SYSTEMS FOR PEOPLE	\$ 1.2M	\$ 1.1M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Task is to provide the human capabilities and skills data to design more easily trained and more effectively used equipment systems.

More data are required by designers on the skills and capabilities of Army personnel if they are to successfully design optimally useable equipment. This need is particularly evident in the area of human interaction with complex equipment or where training cannot cover all anticipated conditions. There is also a less evident need for additional research in the more traditional areas of human factors because of the continuing development of new sensors, displays, and response devices.

Designers need convenient procedures, aids, or devices in order to incorporate data on human capabilities and skills in their designs. Better methods of information transfer and utilization are required if the human factors discipline expects its findings to be applied to real-world problems.

In FY89/90, it is planned to improve models that relate underlying human-machine performance and overall system effectiveness.

## PAYOFF/UTILIZATION:

The payoff of this Task includes better and more effectively utilized manpower, personnel, and training data, resulting in equipment that can be more mission-effective and easier to train and maintain.

In FY88, specific accomplishments included developing methods through an adaptive software interface to improve human-computer interaction.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: B74F-MP	PLANNING, PROBLEM SOLVING AND DECISION MAKING	\$ 0.9M	\$ 0.8M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Task is to understand the biases and logical fallacies in human judgement, reasoning, and decision making, and to discover what can be done to compensate for these limitations.

As a result of larger, more rapid, and increasingly sophisticated computer-driven Army systems, decision-makers must function under conditions of extreme time stress and potential information overload. In numerous problem-solving situations, people perform more poorly than would be predicted on the basis of their existing knowledge or performance on related problems. They often do not use the knowledge they have, or are fixed in their approach to problems. Research is needed that will help: (a) to understand the process of knowledge access, cognitive flexibility, and generation of multiple and conflicting hypothesis, and (b) to design problem solving or planning aids to overcome these limitations.

Traditionally, decision research has relied on analysis of utilities, costs, and benefits, yielding decision support systems that quantify these factors and produce decision recommendations. However, recent efforts show that people do not use information as these models imply. Moreover, in real decision situations, available data may be incomplete or questionable. The psychology of decision-making and how intelligent computer systems could aid this process in a manner compatible with human thought processes needs to be investigated so that compatible systems can be designed. The relationship between decision making, planning, and problem-solving by individuals and group also needs to be addressed.

The development of computerized aids for problem-solving is of great interest to the Army. Methods and procedures used to solve problems include: (a) procedures of interactive branching techniques used in heuristic problem-solving, (b) rule-based problem-solving, (c) goal-directed problem-solving, (d) the nonlinear approach often used by experts, and (e) the inductive approach whereby individuals reason backward from fragmentary, less-than-perfect pieces of evidence to determine an underlying scheme, purpose, or reason. It is anticipated that, in the future, some Army problems will require rapid solutions from two or more individuals physically removed from each other who may not have access to identical databases. Types of network controls and mechanisms are necessary for such distributed group problem-solving and the extent of data based redundancy required in such situations is of concern.

Research is underway in the area of structured planning, particularly into the rules and procedures used to plan for ill-defined future scenarios. The Army Research Institute (ARI) supports research on how planners generate new goals, modify goals, and create alternate goals. Most current planning systems are limited in that they incorporate fixed goals which are incapable of changing. This research aims at providing more adaptive planning systems in the future. Experienced planners or decision makers often incorporate

subjective value judgements into their planning and decision-making processes which they cannot verbalize but which often turn out to be valid. ARI also supports research to develop methods for incorporating the user's value judgement into machine systems planning operations.

Research is also needed on constraint modification and development of alternatives. Current planning systems have constraints built into them when they are initiated. However, constraints often differ according to level of importance, and some may be modified by human users during operation. Additional areas of support include: (a) distributive planning, in which experts in different subject matter areas are geographically removed from each other, (b) generic planning, to develop systems capable of producing plans for different subsets of related areas or situations, and (c) meta-planning, or planning for planning.

#### PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) providing the basis for designing planning and decision aids that can organize, analyze, and synthesize data in ways which will be maximally useful in Command, Control, Communication and Information (C3I) contexts, and (b) enabling the Army to more effectively aid and train its leaders to make decisions.

In FY88, specific accomplishments included identifying conditions of knowledge acquisition that increase subsequent access to knowledge in novel problem-solving situations.

## PROJECT OVERVIEW

		89	90
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PROJECT: B74F-ST	SKILL BUILDING TECHNOLOGIES	\$ 1.3M	\$ 1.1M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Task is to apply new techniques and technologies in intelligent and robotic computers to aid personnel and train them faster in the full use of their increased weapons and information capabilities.

With advancing weapons and communication technology, the quantity and complexity of information to be dealt with by officers and enlisted personnel have increased by orders of magnitude. This research will access and evaluate technologies underlying reports concerning unconventional human technologies for enhancing performance. These technologies may provide the means for accelerating learning, increasing attention, and providing for increased mental and physical peak performance to sustain troops under combat conditions. This research will investigate whether these technologies may also provide improved methods for job classification and assignment.

One of the major problems of many large-scale systems is determining how to collate and organize information for future use and the appropriate categories and mechanisms for retrieving it at the needed time. Research on human knowledge has resulted in a variety of knowledge structures: hierarchies, networks, schematic representations, prototypes, and decision rules. A critical issue is what kinds of representations are most appropriate for various knowledge domains and purposes. Research is needed on methods of knowledge transfer, from one expert or a variety of sources, into a comprehensive system. Methods of coding, collating, organizing, storing, and retrieving need to be developed. Research is also needed on flexibility of knowledge representations, representing dynamic information, and inclusion of value information or weighting in knowledge bases.

Research on development of expertise in complex task domains is critical in order to design effective instructional and training systems. Practically no research has addressed the perceptual reorganization that occurs when one advances from the journeyman to expert level of functioning. The Army needs to examine the fundamental mechanisms of learning in a cognitive science framework that lead to the development or reorganization of knowledge schemata, and subsequently conduct research on how to structure the learning environment to enhance such learning.

Much training has been based on superficial task analyses, yet areas in which significant training improvements have been made have resulted from a deeper understanding of the cognitive and contextual factors involved in performance. These analyses have resulted in descriptions of the users' "mental models" which are the critical intermediaries of performance. Research is needed on how people develop and structure mental models in several complex task areas, particularly where transfer or generalization of learned skills has been poor, or where retention or updating of skills is a serious issue.

A primary focus of research within the area of learning is methods for initially creating new databases from discrete information and for

incorporating new information into an existing database. This latter topic applies both to information from the outside environment and to internally generated input based on the experience of an individual user of the system itself. Finally, although it is well known that new tasks often are learned by extrapolation from previous learning experiences or through analogies, basic research is needed to explore the mechanisms by which humans accomplish this kind of learning and how these mechanisms could be incorporated into machine programs.

In FY89/90 it is planned to develop a model of human error in cognitive tasks.

**PAYOFF/UTILIZATION:**

The payoffs of this Task include the necessary knowledge to develop more effective Army systems by improving both the skills of the soldiers who operate the systems, and by reducing the apparent complexity and difficulty of equipment operation itself.

## PROGRAM ELEMENT OVERVIEW

PE: 62716A                      HUMAN FACTORS ENGINEERING TECHNOLOGY  
CONGRESSIONAL CATEGORY:      HUMAN FACTORS  
DoD ORGANIZATION:            ARMY  
  
FUNDING:                      FY89 \$ 15.0M (FY90 PRESIDENT'S BUDGET)  
                                 FY90 \$ 14.9M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to maximize the effectiveness of the soldier and his materiel in order to service and win wars.

Soldiers using materiel win wars, and for materiel to be most effectively used by soldiers, it must be designed for soldiers. This Program Element is focused on maximizing the effectiveness of the soldier, in concert with his materiel, in order to survive and prevail on the battlefield. The rapid changes in technology and the ever-increasing emphasis on soldier and equipment performance provide the driver for this effort. Specialized laboratory investigations and field evaluations are conducted to collect performance data on the capabilities and limitations of soldiers and materiel, with particular attention to their interaction. The resulting data are the basis for design standards, guidelines, handbooks, and soldier training requirements for operation and maintenance of weapon systems and equipment. The application yields reduced workload, fewer errors, enhanced soldier protection, user acceptance, and allows the soldier to extract the maximum performance from his system.

This Program Element also provides funds for overall administration and management of RDTE, A laboratories. The costs include salary, travel, equipment, and general support of civilian management personnel and their administrative support staffs.

The work within this Program Element will be performed by the US Army Human Engineering Laboratory (HEL).

## RELATED ACTIVITIES:

Leader in tri-Service coordination through the DoD Human Factors Technology Advisory Group, US Army Missile Command (MICOM) agent for Human Factors (HFAC) Standardization. There is no unnecessary duplication of effort within DoD.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include technologies, designs, data, and procedures that: (a) reduce workload, errors, and time to accomplish tasks, (b) increase soldier protection and soldier equipment compatibility for individual and crew weapons in aviation, armor, artillery, and air defense, and (c) enhance particular individual items of equipment, information displays, operating controls, computer programs, and crew working environments.

## FUTURE DIRECTIONS:

Future thrusts include plans to develop and exploit state-of-the-art technologies such as artificial intelligence and expert systems for application to battlefield robotics, supply and materiel handling and management, next-generation armor and artillery systems, small arms and

anti-armor weapons, soldier tasks/loads, soldier protection, aviation and air defense control/display systems, and future hybrid/multiple integrated weapons and defense systems.

Plans for FY91 will include: (a) continue soldier-robot interface research efforts in multiple control, remote operations, low rate visual data transmission, and robotic hand and wrist capabilities which are critical to the effective Army introduction of dextrous manipulator systems and remote operation of vehicles, (b) conduct laboratory technology developments in artificial intelligence and expert systems to determine the feasibility of the concepts developed in FY89 for the knowledge based decision support system for tactical ammunition management; research is aimed at improving Army logistics capabilities and planning under battlefield conditions, (c) develop an operational prototype of the tactical ammunition management decision support system, based on previous laboratory development and experimentation, (d) conduct and complete an evaluation of field artillery battlefield decision-making in conjunction with TRADOC, which will include allocation and positioning of units, as well as coordination and distribution of fires, in order to develop a comprehensive fire support decision aid for battlefield application, and (e) establish a soldier performance database with respect to the relationship between speech intelligibility and armor crew performance; study results will provide a metric on which to base design recommendations to improve man-machine performance as related to future armor fighting vehicle development.

## PROJECT OVERVIEW

		89	90
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PROJECT: A1QL	ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)	\$ 7.1M	\$ 0.0M
PE: 62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY HUMAN ENGINEERING LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to program costs associated with overall management and administration of RDTE,A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY87, RDTE funds to finance overall management and administration of RDTE,A laboratories were prorated to R&D research, systems development projects, and other Army customers. Adjustments were made on a zero-sum basis within Army appropriations.

The resources for this Project were transferred to Project AH70, Program Element 62716A for FY90 through FY94 as a zero transfer.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.



## PROJECT OVERVIEW

		89	90
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PROJECT: AH70	HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT	\$ 7.9M	\$14.9M
PE: 62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY HUMAN ENGINEERING LABORATORY		

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PROJECT SYNOPSIS:

The objectives of this Project are to: (a) generate data on soldier-system interfaces, soldier-system performance, and the capabilities and limitations of soldiers, and (b) provide for the application of these data throughout the Army materiel development process.

Human engineering acquires human performance data and provides design guidance for all types of equipment that are worn, operated, or maintained by soldiers. Specific and precise information is also developed on soldiers' physical and psychological capabilities and limitations, so that Army materiel systems will be designed for maximum field effectiveness in the hands of the soldier. This is increasingly important as weapon systems and materiel become more sophisticated.

In FY89, it is planned to: (a) develop artificial intelligence/expert system concepts for a knowledge-based decision support system for tactical ammunition management in order to reduce soldier workload and increase efficiency and transition the results to the logistics community, (b) publish human factors guidelines for Small Arms Design incorporating performance data pertain 60-70 to hit probability, sustainability, and target acquisition capability; this guide will be used by system designers to ensure soldier and individual weapon compatibility, (c) demonstrate innovative robotic field materiel-handling concepts which will increase productivity in the handling of ammunition in forward area ammunition supply points; these concepts will be transitioned to Belvoir Research and Development Engineering Center (BRDEC), (d) study Forward Area Air Defense control and display concepts, configurations and automatic cueing techniques to determine the effect of these concepts on operator performance and to serve as design guidance for air defense improvement programs; transition the products to Aviation Systems Command (AVSCOM) and Missile Command (MICOM), and (e) evaluate fire support maneuver commander's tasks, equipment and information requirements to determine the efficacy of using automation tools/digital display devices as commander aids for combat decision making; transition successfully demonstrated products to the Training and Doctrine Command (TRADOC).

In FY90 it is planned to: (a) initiate field evaluations of new command and control concepts and target cueing techniques to improve the soldier-command-control-communication (C3) interface in a combined arms forward area air defense battlefield situation; transition results to TRADOC, (b) conduct research to determine soldier information display and control requirements for remote operators of vehicles and manipulators performing battlefield tasks, (c) conduct research to quantify the portability and physiological energy cost of carrying various infantry equipment loads under simulated battlefield conditions; data will assist materiel developers (Natick order) in efforts to lighten the soldier's load, (d) complete a combat vehicle design handbook to assist materiel developers in crew area noise reduction in future armored vehicles and distribute to user community, and (e) conduct human factors engineering evaluations of advance combat

rifles focusing on such issues as round-to-round dispersion and reliability in order to improve overall performance.

#### PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) human performance data and design guidance for equipment worn, operated, or maintained by soldiers, and (b) specific, precise information on soldiers' physical and psychological capabilities and limitations so that sophisticated Army materiel systems will be designed for maximum field effectiveness.

In FY88, specific accomplishments included: (a) demonstrating improved displays, joint field evaluations with the Field Artillery School, and built-in training devices for fire support equipment originally scheduled for FY88, has been broadened significantly to include a number of new North Atlantic Treaty Organization (NATO) country concept items, which are presently being planned to be integrated into a much larger program, to be conducted later in preparation of a new field artillery system to be developed in the late 1990s, (b) completing soldier marksmanship performance using various optical sights; the research established the fact that the extension of the combat day through use of the sights was minimal and that the optical sights were not cost effective, (c) demonstrating, as part of the Field Assistance in Science and Technology (FAST) program, five concept materiel items for (1) improving gunnery performance in the M1 tank, (2) night operations with armored vehicles, (3) new sleeping capability in tanks, (4) new communication equipment while wearing chemical protective masks, (5) new gunnery display equipment for 105mm artillery weapons, and (d) development and publication of an equipment operation task analysis standard for Army-wide and DoD implementation for use as part of the Manpower and Personnel Integration (MANPRINT) initiative to permit better design of Army materiel.

## PROGRAM ELEMENT OVERVIEW

PE: 62727A                      NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY  
CONGRESSIONAL CATEGORY:      SIMULATION & TRAINING DEVICES  
DoD ORGANIZATION:            ARMY  
  
FUNDING:                      FY89 \$ 3.4M (FY90 PRESIDENT'S BUDGET)  
                                FY90 \$ 4.4M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to provide exploratory development of state-of-the-art generic training methods and equipment to increase overall combat effectiveness while reducing Army training costs.

Arrival of sophisticated, high-technology equipment and their complex relations to each other, coupled with increased constraints on personnel, money, and time in the field training environment, makes this effort critical to the overall success of the Army. As an example, support from this program resulted in a Multiple Integrated Laser Engagement Simulation System (MILES), Gas-Operated Cannon Simulator for 20mm, 25mm, and 30mm ammunition, which eliminated the need to develop and produce blank rounds, at a peacetime savings per year of over \$10M.

This work is performed by PMTRADE, Naval Training Systems Center (NTSC), Army Research Institute (ARI), and NASA-Jet Propulsion Laboratory (JPL).

## RELATED ACTIVITIES:

PE #0603738A and PE #0604715A (Non-System Training Devices Advanced Development and Engineering Development). Activities are coordinated through tri-Service participation of DMA, NAVAIR, and Air Force Deputy for Training Systems to ensure no duplication.

## PAYOFF/UTILIZATION:

The payoff of this Program Element includes support for the development of technology for training devices that ties together battlefield weapon systems, mobility, and command, control, communications, and transfers this training to real-world combat effectiveness.

Previously, this program supported exploratory development which resulted in, for example, a Multiple Integrated Laser Engagement Simulation System (MILES) gas-operated cannon simulator for 20mm, 25mm, and 30mm ammunition which eliminated the need to develop and produce blank rounds, resulting in peacetime savings per year of over \$10M.

## FUTURE DIRECTIONS:

In FY91, it is planned to: (a) transition successful findings from National Training Center concept exploratory studies into development and acquisition of simulation and simulators, from battalion-size to brigade-size training capability, and (b) implement automated, rule-based system engineering design and evaluation tools for optimizing simulator and training device effectiveness.

## PROJECT OVERVIEW

		89	90
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PROJECT: A230	NON-SYSTEM TRAINING DEVICES	\$ 3.4M	\$ 4.4M
PE: 62727A	NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

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PROJECT SYNOPSIS:

The objective of this Project is to provide for the exploratory development of training devices technology that supports general military training and training on more than one item or system.

This program provides the necessary front-end analytical effort needed to transition suitable developments into full-scale development.

In FY89, it is planned to: (a) initiate an interdisciplinary program for optimization and evaluation of Army training devices with the University of Central Florida Institute for Simulation and Training, to explore in coordination with industry: large-scale simulation networking techniques, development of modular simulator design standards, rapidly reconfigurable simulator databases and training systems measures of effectiveness, and (b) initiate National Training Center upgrade concept explorative studies to evaluate the use of simulation as a cost effective means of expanding from battalion-size to brigade-size training capability.

In FY90 it is planned to: (a) demonstrate the feasibility of simulating Intelligence/Electronic Warfare systems with real time, non-emitting, simulated threat emission signatures for training at National Training Centers and in units, and (b) publish modular simulator design standards as part of tri-Service/Industry Joint Technical Coordinating Group for Training Systems and Devices program.

## PAYOFF/UTILIZATION:

The payoff of this Project includes a variety of exploratory development efforts in training devices technology to support general military training and training on more than one item or system.

Non-system training device requirements vary in scope and complexity and include simulations to support force-on-force engagement simulation training, collective training of crews and units (as well as individual basic skills) and integration and sustainment training. Results of this Project's technology base efforts are inserted directly into advanced simulator designs, or transitioned to a product-oriented demonstration, or directly into production.

FY88 specific accomplishments included: (a) demonstrated feasibility of non-live fire laser engagement tank gunnery and maneuver range for improving combat capability without additional ammunition usage, (b) completed guidelines for selection and implementation of embedded training, (c) continued efforts on the combined arms communication networking simulation, and (d) initiated development effort for system rapid reconfiguration of computer-generated imagery.

## PROGRAM ELEMENT OVERVIEW

PE: 62785A                      MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY

CONGRESSIONAL CATEGORY:      HUMAN FACTORS  
                                  SIMULATION & TRAINING DEVICES  
                                  EDUCATION & TRAINING  
                                  MANPOWER & PERSONNEL

DoD ORGANIZATION:            ARMY

FUNDING:                      FY89 \$ 17.7M (FY90 PRESIDENT'S BUDGET)  
                                  FY90 \$ 17.1M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this Program Element is to provide a scientifically sound basis for maximizing soldier and unit performance by identifying: (a) how the soldier's workload can be "shifted from the head to the hardware," in the design of new weapon systems, (b) how information must be made available to system designers to ensure compatible man-machine systems, (c) how simulator and training device design features are necessary to ensure effective training at minimal cost, and (d) how behavioral sciences can improve the recruiting, selection, and retention of quality soldiers in this high technology environment with a dwindling supply of military age adults, and an increasing demand for technically qualified labor.

This Program Element also provides funds for overall administration and management of RDTEA laboratories. The costs include salary, travel, equipment, and general support of civilian management personnel and their administrative support staffs.

Work within this Program Element will be performed by the Army Research Institute for the Behavioral and Social Sciences (ARI).

## RELATED ACTIVITIES:

Results of this project transition to Advanced Development in Program Element #0603007A (Human Factors, Personnel and Training Advanced Technology). Potential for duplication of effort is avoided through an annual Science and Technology Program Review chaired by a representative of the Office of the Secretary of Defense. Coordination is furthered through Department of Defense (DoD) Topical Reviews, participation in the DoD Human Factors Engineering Technical Group, and the DoD/NASA Simulation Technology Coordination Panel. This Program Element is further coordinated with personnel research and development organizations of the other Services: the Air Force Human Resources Laboratory (AFHRL), the Navy Personnel Research and Development Center (NPRDC), the Army Project Manager for Training Devices (PM TRADE), the Army Human Engineering Laboratory (HEL), and the Naval Training Systems Center (NTSC).

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include a scientifically sound technology base to support the: (a) development of engineering designs for new systems so that strengths and limitations of operators and maintainers are appropriately utilized or compensated for, (b) the development of improved methods for attracting, selecting, assigning, and retaining quality soldiers, and (c) the development of methods for improving individual and collective (unit) training.

## FUTURE DIRECTIONS:

Future plans include continuing efforts to: (a) achieve a better understanding of the optimal interface and division of labor between man and machine, as well as of how human factors, manpower, personnel, and training information are considered in new weapon systems, (b) improve decision-making in command and control operations, (c) ensure the most cost-effective soldier selection and assignment, (d) target enlistee training requirements more precisely, and (e) focus on new personnel selection and training issues.

In FY91, plans for the Manpower, Personnel and Training Project include to: (a) demonstrate a prototype force structure planning model for active and reserve components, (b) develop a methodology to generate job performance prediction equations and selection standards, and (c) develop training strategies for combined arms collective training.

In FY91, plans for the Human Performance Effectiveness and Simulation Project include to: (a) develop a prototype method for predicting weapon system performance degradations due to soldier stress, sleep loss, and fatigue, (b) determine crew selection criteria for reducing human-error induced accidents in Army aviation, (c) determine collective staff skill requirements for the Army Tactical Command and Control system, and (d) evaluate affordability and effectiveness of flight simulator visual system technology.

## PROJECT OVERVIEW

		89	90
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PROJECT: A2AL-ET	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)	\$ 1.0M	\$ 0.0M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Project is to improve resource management and costs associated with overall management and administration of RDTE,A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY87, RDTE funds to finance overall management and administration of RDTE,A laboratories were prorated to research, systems development projects, and other Army customers. Adjustments were made on a zero sum basis within Army appropriations.

The resources from this Project were transferred to Project A791, Program Element 62785A for FY90 through FY94 as a zero sum transfer.

The funds within this Project support the Education and Training aspect of this Program Element.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

## PROJECT OVERVIEW

		89	90
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PROJECT: A2AL-HF	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)	\$ 2.0M	\$ 0.0M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Project is to improve resource management and costs associated with overall management and administration of RDTE, A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff.

These resources were transferred to Project A791, Program Element 62785A, for FY90 through FY94 as a zero sum transfer.

This Project supports the Human Factors portion this Program Element.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.



## PROJECT OVERVIEW

		89	90
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PROJECT: A2AL-MP	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)	\$ 2.4M	\$ 0.0M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Project is to improve resource management and costs associated with overall management and administration of RDTE, A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY87, RDTE funds to finance overall management and administration of RDTE, A laboratories were prorated to research, systems development projects, and other Army customers. Adjustments were made on a zero sum basis within Army appropriations.

These resources were transferred to Project A791, Program Element 62785A, as a zero sum transfer.

This Project supports the Manpower and Personnel portion of the Program Element.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

## PROJECT OVERVIEW

		89	90
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PROJECT: A2AL-ST	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)	\$ 1.8M	\$ 0.0M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Project is to program costs associated with overall management and administration of RDTE, A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY87, RDTE funds to finance overall management and administration of RDTE, A laboratories were prorated to research, systems development projects, and other Army customers. Adjustments were made on a zero sum basis within Army appropriations.

These resources will be transferred to Project A791, Program Element 62785A as a zero sum transfer. This Project supports the Simulation and Training Devices portion of this Program Element.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

## PROJECT OVERVIEW

		89	90
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PROJECT: A790-HF	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION	\$ 2.7M	\$ 2.3M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objectives of this Project are to: (a) determine the most effective integration of human decision makers and automated information technology in new Army systems, and (b) obtain empirical data for relating human factors, manpower, personnel, and training variables to weapon systems effectiveness.

The battlefield of the future will place greater demands on soldiers and leaders alike; the tactical employment of more sophisticated, more lethal weapons systems, and the operation of automated command, control, communication and intelligence (C3I) systems will require quick reactions and confident decisions.

In FY89, it is planned to: (a) develop a prototype model for assessing stress and fatigue effects on combat unit performance, (b) develop methods for determining the human factors causes of accidents in Army aviation, (c) build an intelligence and electronic warfare (IEW) processing and utility evaluation model for division-level intelligence support, (d) build a prototype model for assessing the impact of soldier errors on total system performance of automation-intensive weapon systems, and (e) develop artificial intelligence (AI)-based techniques to assist military linguists to acquire and sustain job-relevant foreign language skills.

In FY90 it is planned to develop a prototype risk-awareness estimation technology for reducing accidents in "live fire" artillery training exercises.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improved use of human capabilities and modern technology in the design of new systems to ensure greater effectiveness in the battlefield.

In FY88, specific accomplishments included: (a) the development of a methodology for eliciting expert knowledge used in intelligence and electronic warfare (IEW) analyses, and (b) the design of prototype methods for estimating weapon system operator mental workload.

## PROJECT OVERVIEW

		89	90
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PROJECT: A790-ST	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION	\$ 2.4M	\$ 2.1M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objectives of the Simulation and Training Devices portion of this Project are to experimentally determine the minimum design requirements for simulators/training devices that will achieve effective training at the lowest cost.

The battlefield of the future will place greater demands on soldiers and leaders alike. The tactical employment of more sophisticated, more lethal weapons systems, and the operation of automated command, control, communication and intelligence (C3I) systems will require quick reactions and confident decisions. Effective training is one way of achieving this.

In FY89 it is planned to develop and evaluate tank gunnery training and testing strategies.

In FY90 it is planned to: (a) build an improved prototype tactical battle staff training technology, (b) develop prototype graphic formats for the remote exchange of tactical planning data within a distributed command and control system, and (c) determine minimum visual system simulation fidelity requirements for effective training.

This Project was transferred from PE 62717A, effective FY88.

## PAYOFF/UTILIZATION:

The payoffs of this Project include cost-effective training by determining: (a) the minimum design requirements for simulators and training devices that will achieve effective training at the least cost, and (b) the requirements for automating maintenance training "courseware" development.

In FY88 specific accomplishments for the Simulation and Training Devices portion of this Project included the development of a computer-generated imagery (CGI) visual database for attack helicopter training.

## PROJECT OVERVIEW

		89	90
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PROJECT: A791-ET	MANPOWER, PERSONNEL AND TRAINING	\$ 1.5M	\$ 3.6M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objectives of this Project are to provide the scientific basis for: (a) theory-based training methods to cost-effectively provide high technology skills for soldiers in both the Active Army and the Reserve Components, and (b) objective methods for assessing crew and unit performance.

To meet future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel in the face of a dwindling supply of young adults, and competition from the private sector, the Army needs to improve the methods for carrying out these functions.

In FY89, plans include to: (a) refine and evaluate new methods of job analysis and procedures for setting performance standards for enlisted Military Occupational Specialties (MOSs), (b) conduct cooperative research with the Federal Republic of Germany (FRG) and the Israeli Defense Force (IDF) on leadership, cohesion and unit performance for cost effective leveraging of U.S. Allies R&D, and (c) develop measures of unit performance in combined arms exercises.

In FY90, plans include to: (a) develop a prototype unit skill acquisition and retention model, and (b) design the concept for automated tools to aid training program developers ("automated authoring").

This Project was transferred from PE 62722A, effective FY88.

## PAYOFF/UTILIZATION:

The payoff of this Project includes improved methods for meeting future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel.

In FY88, specific accomplishments included: (a) development of procedures for establishing job performance standards for enlisted Military Occupational Strategies, and (b) development of an expert system for aiding instructional system designers.

## PROJECT OVERVIEW

		89	90
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PROJECT: A791-MP	MANPOWER, PERSONNEL AND TRAINING	\$ 3.9M	\$ 9.1M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objectives of this Project are to provide the scientific basis for: (a) force structure planning, analyzing of compensation policies and computer-based selection tests, and (b) integrating methods for estimating manpower levels and soldier skills required by new Army weapon systems.

To meet future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel in the face of a dwindling supply of young adults, and competition from the private sector, the Army needs to improve the methods for carrying out these functions.

In FY89, plans include the development of algorithms to estimate the effects of compensation and family factors on soldier retention and Army readiness.

In FY90, plans include to: (a) demonstrate a prototype model measuring the effects of compensation and family factors on enlisted retention in the Army Reserve Components, and (b) develop a Preliminary Army Force Structure Planning Model to translate required unit functional capabilities into qualitative and quantitative personnel requirements.

## PAYOFF/UTILIZATION:

The payoff of this Project includes improved methods for meeting future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel.

In FY88, specific accomplishments include the completion of a case study of cohesion factors in the South Atlantic Conflict of 1982 for lessons learned.

## PROGRAM ELEMENT OVERVIEW

PE: 63003A AVIATION ADVANCED TECHNOLOGY  
 CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES  
 DoD ORGANIZATION: ARMY  
 FUNDING: FY89 \$ 5.4M (FY90 PRESIDENT'S BUDGET)  
 FY90 \$ 4.0M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this Program Element is to provide for the advanced development, integration, and demonstration of full-scale technology components and subsystems.

Modern Army aircraft face an awesome array of air defense threats which include: (a) optically and radar-equipped 23mm and 30mm air defense guns, (b) SA-11, -13, and -14 infrared and radar-guided missiles, and (c) potential nuclear/biological/chemical and laser threats directed and delivered both from the ground and air vehicles. As a result, the aircraft must possess improved mobility, agility, firepower, and inherent features to include durability and sustainability for extended periods of combat at an affordable cost. Army aircraft must be durable, damage-tolerant, easy to repair and maintain, and possess the highest level of availability possible. The application of fiber-optic technology to flight control components, advanced rotor technology to existing and proposed rotor systems, as well as the development of advanced simulation technology and advanced avionics are the keys to providing reliable, survivable Army aircraft essential to the future integrated battlefield. These demonstration programs represent investments in technology to maximize Army aviation's future capability to perform its combat mission. Emphasis is placed on: (a) ballistically-tolerant material, (b) electronic hardware to enable day/night, adverse weather aviation operations (avionics), and (c) advanced flight controls for reduced weight and cost, improved survivability, reduced pilot workload, and initial training requirements.

The efforts to be accomplished under this program element will be a significant part of the technology base for establishing criteria and specification for block improvements to the existing fleet, as well as providing the needed technology for the next generation Army aircraft of the mid-to-late 1990s. Selected near-term advances may be applied to aircraft, such as the UH-60 Blackhawk and AH-64 Apache, as block improvements. This program provides the technology thrusts that are essential if Army aviation is to continue to effectively contribute to the Air-Land Battle of the 1990s and into the 21st century. A major thrust of this program is the development of an integrated cockpit utilizing advanced simulation technology flight controls, avionics, weaponization, and power plants, all of which are required to improve aircraft effectiveness and survivability.

This Program was a new Program Element in FY88, which combines the Projects formerly reported under six Program Elements: 63201A (Aircraft Power Plants and Propulsion), 63206A (Aircraft Weapons), 63207A (Aircraft Avionics Equipment), 63211A (Rotary Wing Controls, Rotors and Structures), 63216A (Synthetic Flight Simulators), and 63221A (nap-of-the-earth [NOE] Avionics and Navigation Equipment), all of which are used to demonstrate Army aircraft technology.

The developers of the technology under this Program Element include Project Manager for Training Devices, and US Army Aviation Systems Command. Work-related activities are performed by the National Aeronautics and Space Administration (NASA).

## RELATED ACTIVITIES:

Close liason is maintained with other Services, other Army laboratories, and industry to ensure there is no duplication of effort. As part of that coordination, the Army participates in the Department of Defense Tri-Service Joint Technical Coordination Group for Munitions Development; Acoustical Society of American Standards, Committee on Acoustics and Noise, Air Standardization Coordination Committee, Working Party 10; Advisory Group for Aerospace Research and Development; and the Military Agency for Standardization, Aircraft Instruments and Aircrew Stations Working Group, North Atlantic Treaty Organization Air Armament Working Party and the Air Standardization Coordinating Committee of NATO.

The technical information and determination are for joint use and standardization of airborne weaponization items. An Army Development Committee (AMRAD), is also an organization within the Office of the Secretary of Defense. One function of this committee is the establishment of joint-Service requirements and development of air munitions.

Related concept exploration is conducted under Program Element #0602211A (Aviation Technology) and full scale development under Program Element #0604801A (Aviation Engineering Development) and #0604202A (Aircraft Weapons). An important element of the coordination on-going is the Memorandum of Agreement (MOA) which exists with the Air Force between the US Avionics R&D Activity (AVRADA) and Air Force Wright Aeronautical Laboratories. Under that MOA, AVRADA is responsible for participation as an active member in the Integrated Communications, Navigation and Identification Avionics Program (ICNIA).

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include improved aircraft mobility, agility, firepower, and inherent features to include durability and sustainability for extended periods of combat at an affordable cost.

Army aircraft will be durable, damage tolerant, easy to repair and maintain, and possess the highest level of availability possible. The application of fiber-optic technology to flight control components, and advanced rotor technology to existing and proposed rotor systems, as well as the development of advanced weapons and fire control, advanced engines and drive trains, advanced simulation technology and advanced avionics are the keys to providing reliable, survivable Army aircraft essential to the future integrated battlefield.

## FUTURE DIRECTIONS:

The efforts to be accomplished under this Program Element will be a significant part of the technology base for the next-generation Army aircraft of the mid-to-late 1990s. This program funds technology thrusts that are essential if Army aviation is to effectively contribute to the Air-Land Battle of the 1990s and into the 21st century as it does to the current Army combined arms team.

Failure to fund these efforts will preclude the development of: (a) critical optical components for use in advanced flight control systems, (b) advanced avionics, (c) advanced composite aircraft structures, and (d) advanced power plants and advanced rotor hubs, all of which are required to improve aircraft effectiveness and survivability.

In FY91, plans for the Rotorcraft System Integration Simulator (RSIS) Project include: (a) development of the extended field-of-regard system for the motion simulator, and (b) integration of simulation capabilities with the Crew Station Research and Development Facility.

In FY91, plans for the Flight Simulator Components Project include initial rapidly reconfigurable database capability established together with a



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standard transform enabling users to access the tri-Service standard simulator database.

## PROJECT OVERVIEW

		89	90
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PROJECT: DB34	ROTORCRAFT SYSTEM INTEGRATION SIMULATOR (RSIS)	\$ 4.0M	\$ 3.2M
PE: 63003A	AVIATION ADVANCED TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	AVSCOM		

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PROJECT SYNOPSIS:

The objective of this Project is to develop the advanced Rotor System Integration Simulator (RSIS) by expanding the capabilities of the National Aeronautics and Space Administration's (NASA's) Vertical Motion Simulator (under a joint-Army-NASA agreement), in order to reduce costs and development time on new rotorcraft.

Numerous studies, including those by the Army Scientific Advisory Panel (ASAP), and an ad hoc working group on research facility requirements for nap-of-the-earth (NOE) day/night visual flight studies, recommended that the Army, as the lead Service for helicopter R&D, place increased emphasis on R&D in helicopter flying qualities using ground-based simulation. The Army-NASA agreement minimizes costs of a high-fidelity simulator, and allows for increased technical expertise in the development of this Aeronautical Engineering Research Facility.

In FY89, plans include to: (a) complete the development of the Advanced Cab and Visual System and integrate it with the advanced Vertical Motion System, (b) initiate the upgrade of the motion systems visual field-of-view for upgrade of the Vertical Motion Simulator, and (c) continue development of the AH-64 math model and development of an extended visual system database for simulation.

In FY90, plans include to: (a) continue visual system improvements and develop the extended visual system database, and (b) complete development of attack helicopter high-fidelity simulation capability enhancement.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) detailed evaluation of engineering concepts before a commitment to aircraft hardware, (b) compressed development time, and (c) reduced cost.

In FY88, specific accomplishments included: (a) integrated and man-rated the Rotorcraft Systems Motion Generator on the Vertical Motion Simulator, (b) completed the first operational simulation on integrated motion system, and (c) initiated development of an AH-64 math model and developed extended visual system database for simulation.

## PROJECT OVERVIEW

		89	90
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PROJECT: DB39	FLIGHT SIMULATOR COMPONENTS	\$ 1.3M	\$ 0.0M
PE: 63003A	AVIATION ADVANCED TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

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PROJECT SYNOPSIS:

The objective of this Project is to develop and demonstrate advanced flight simulation techniques and components for incorporation into the design of future simulators and for improving training capabilities of current simulators.

This effort is being accomplished through cooperative development with Navy and Air Force laboratories. Efforts are directed to developing visual simulation components designed to provide full mission training capability for nap-of-the-earth (NOE) flight, navigation, gunnery, and survivability in a combat environment. The current program includes preliminary design studies and brassboard demonstration for the development of wide-angle, high resolution, high-pictorial-detail visual simulation techniques that provide large frontal and downward angle viewing for NOE flight. These techniques will also integrate multiple viewpoint sensor displays which are vitally needed for simulating weapon systems tactical missions and crew integration training. Technology includes computer-generated image (CGI) edge management techniques for full mission simulation.

In FY89, plans include to: (a) complete incorporation of Ada computer language on Army flight simulator for demonstration and (b) evaluate real time simulation in the ADA programming environment.

In FY90, plans include to initiate the development effort for a system for rapid reconfiguration of computer-generated imagery to be used in training Army aviators and combat vehicle crews.

This Project was transferred from PE 63216A, effective FY88.

## PAYOFF/UTILIZATION:

The payoff of this Project includes development of visual simulation components designed to provide full mission training capability for NOE flight, navigation, gunnery, and survivability in a combat environment.

These devices will enhance the navigational and target recognition and acquisition skills of rotorcraft system crews, increasing Army aviation combat readiness and proficiency. Visual technology developed in this program will be applied to all air and ground based simulators to improve training quality and reduce training and acquisition costs.

In FY88, specific accomplishments included continued incorporation of Ada computer language on Army flight simulator.

## PROGRAM ELEMENT OVERVIEW

PE: 63007A HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL  
HUMAN FACTORS  
EDUCATION & TRAINING  
SIMULATION & TRAINING DEVICES

DoD ORGANIZATION: ARMY

FUNDING: FY89 \$ 29.2M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 19.0M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this Program Element is to focus advanced technology efforts in four areas of soldier performance by: (a) using human factors in the design of new systems, (b) using improved, theory-based education and training techniques exploiting modern computers, (c) using research and development of design alternatives for lower cost, less complex simulators and training devices, and (d) using scientifically sound methods for recruiting, selecting and retaining manpower to better match supply and demand.

This Program Element is, in part, the Army's response to a Congressional requirement for a Department of Defense-wide effort to relate selection tests and retention criteria to successful job performance. This work is also responsive to the increasingly important need to specify personnel requirements, training requirements, and skill mixes early in weapon system development, and to relate them to the country's available pool of manpower.

This is the Army's concept of Manpower and Personnel Integration (MANPRINT). Human factors development: (a) will examine electronic technology for use in the design of soldier-friendly interfaces between the soldier and the sophisticated equipment he or she must operate and maintain, and (b) will systematically consider the soldier throughout the weapon system design, development and acquisition process.

This Program Element resulted from the consolidation of Program Elements 63731A, 63739A, 63743A, and 63744A, and the restructuring of their Projects into this Program Element, effective FY88. In FY90 Program Element 63736A was included in this Program Element with its Project (A796).

The in-house developing organization responsible for Projects A792, A793, A794, and A795 is the Army Research Institute for the Behavioral and Social Sciences (ARI), and for Project A796 is the Army Human Engineering Laboratory (HEL).

## RELATED ACTIVITIES:

Exploratory development efforts related to this Program Element transition from Program Element #0602785A, Manpower, Personnel and Training Technology, and Program Element #0602716A, Human Factors Engineering Technology.

Coordination of Research and Development (R&D) to preclude unwanted duplication of effort is accomplished with the Air Force Human Research Laboratory and the Navy Personnel Research & Development Center. Coordination is also accomplished through annual Department of Defense budget and management reviews and through membership in tri-Service committees such as the Human Factors Technology Coordination Group, the Human Factors Test and Evaluation Subgroup, and the DoD/NASA Simulation Working Group. Simulation and training device development is coordinated on a continuing basis directly

with the Defense Advanced Research Project Agency (DARPA).

#### PAYOFF/UTILIZATION:

The payoffs of this Program Element include advances in all four areas of soldier performance: (a) manpower supply will be better matched to demand, (b) new system designs will incorporate human factors considerations, (c) education and training will become more technology-based, less expensive, and less complex and (e) simulators and trainers will be developed.

Efforts to improve MANPRINT estimation methods will permit more accurate and timely estimate. This program will further develop expanded application of electronic technology to reduce the cost of training while increasing soldier proficiency. A specific effort on integrating simulator needs with overall training, will provide scientific bases for the design of lower cost and less complex simulators for use in military units, and will answer a 1984 Congressional concern.

#### FUTURE DIRECTIONS:

In FY91, plans for the Manpower and Personnel Project include to: (a) validate the model for estimating costs of alternative enlisted active and reserve force structures under varying levels of soldier quality and demographic characteristics, (b) develop the final revision of the Armed Services Vocational Aptitude Battery (ASVAB) composites to predict soldier performance on the job, (c) determine the validity of new screening measures on DoD Computer Adaptive Testing (CAT) system, (d) develop prototype family-related programs to improve soldier readiness, (e) determine the impact of leadership, cohesion and soldier quality on unit performance in simulated combat exercises, and (f) identify critical variables affecting career paths of civilian managers.

In FY91, plans for the Human Factors in Training and Operational Effectiveness Project include to: (a) determine the validity of workload predictors for the Advanced Field Artillery System, Family or Armored Vehicles, Forward Area Air Defense System, and Automatic Target Handoff System, (b) evaluate different maintenance concepts for the Advanced Field Artillery System and Forward Area Air Defense System Non-Line-of-Sight (NLOS) component, (c) assess crew rotation and soldier cross-training concepts for sustaining combat unit performance, (d) analyze workload distributions between men and machine for improved production of all-source intelligence on the battlefield, (e) develop Brigade-Corps behavioral task model and performance criteria for assessing battlestaff performance, and (f) develop Field Training Exercise (FTX)-Command Post Exercise (CPX) "lessons learned" database for the Battle Command Training Program.

In FY91, plans for the Education and Training Project include to produce methods and measurement techniques for Training and Doctrine Command (TRADOC) to identify issues and derive lessons learned from JRTC data.

In FY91, plans for the Training Simulation Project include to: (a) develop prototype unit training programs using networked combined arms simulators at remote locations, and (b) validate Airland Battle fidelity requirements for force-on-force exercises using networked simulators.

In FY91, plans for the Human Factors Engineering in Systems Design Project include to: (a) refine expert system development and expand the application of the HFE knowledge-based system to the other domains of MANPRINT (manpower, personnel, training, health hazards, and safety) within the Army, and (b) to focus on tri-Service coordination and application to Navy and Air Force human factors elements.

## PROJECT OVERVIEW

		89	90
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PROJECT: A792	MANPOWER AND PERSONNEL	\$ 9.9M	\$ 6.5M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objectives of this Project include developing and evaluating: (a) methods to attract needed personnel to the Army, to select the most qualified, and to assign them to Military Occupational Specialties that capitalize on their aptitudes and vocational interests, and (b) programs to retain highly qualified personnel.

Approaching the year 2000, the number of military-age people in the population will be 20 percent fewer than now. There will also be fewer high school graduates, who are the highest performers and have the lowest attrition rates. The Army must develop ways to attract larger proportions of these high-quality individuals and must improve procedures for their selection and job utilization.

In FY89, plans include: (a) demonstrating of AMCOS for Reserve Component, (b) continuing field trials of Enlisted Personnel Allocation System (EPAS), (c) collecting of data to determine relationship of family factors to individual soldier retention decisions, (d) testing of cognitive skills assessment techniques for use with students at National and Army War Colleges to increase efficiency of leader development programs, (e) assessing of the effects of personnel turnover on small unit leader performance and unit cohesion, and (f) developing of improved techniques for selecting civilian first-line supervisors.

In FY90, plans include: (a) determination of the applicability of AMCOS for estimating Army civilian employee costs, (b) development of preliminary algorithms for selection techniques tailored to emerging weapons systems, (c) establishment of the relationship between warfighting requirements, leader skill development, and unit performance, and (d) evaluation of prototype civilian personnel training and development programs. This Project was transferred from PE 63731A, effective FY88.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improved methods and programs to: (a) attract, select, and retain the most qualified personnel for the Army, (b) assign them to military occupational specialties (MOSs) best using their aptitudes and vocational interests, (c) develop the cohesive units and leaders required for combat readiness in the high-technology Army, and (d) identify aggregated future manpower and personnel needs.

In FY88, specific accomplishments included: (a) demonstration of prototype Enlisted Personnel Allocation System (EPAS) for assignment of new recruits, (b) demonstration of the Army Manpower Cost System (AMCOS) for more accurate estimation of manpower costs for weapons systems for the active force, (c) trial use of new gunnery aptitude screening device to improve selection of TOW, Bradley, Armor, Air Defense and Field Artillery gunners, and (d) identification of critical supervisory tasks and skills for Army civilian

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supervisors.

## PROJECT OVERVIEW

		89	90
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PROJECT: A793	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS	\$ 8.3M	\$ 5.9M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objectives of this Project are to develop and evaluate: (a) improved methods for identifying human factors, manpower, personnel, and training (HMPT) requirements early in the weapon system development process, (b) improved, empirically based methods for assessing the impact of HMPT variables on weapon system operability and maintainability, and (c) prototype technologies for integrating soldiers into complex, information-based weapon systems and command, control, communications, and intelligence (C3I) systems.

Modern weapon systems are becoming more lethal and more complex to operate and maintain on the battlefield. As such, the soldier must be systematically considered throughout the weapon system development and acquisition process.

In FY89, plans include to: (a) test improved methods for identification of manpower savings available from alternative maintenance concepts for the All Source Analysis System (ASAS), and (b) develop improved prototype generation performance-based methods for manpower, personnel and training (MPT) requirements estimation for new systems.

In FY90, plans include to: (a) develop new training/evaluation standards for Forward Area Air Defense (FAAD), (b) develop crew/maintainer performance models for Army family of unmanned aerial vehicles, (c) integrate logistics model with existing MPT requirements estimation method, (d) develop crew coordination training and mission assignment methods to reduce aviation and ground accidents, and (e) develop tactical planning graphics formats for improved C3I system performance.

This Project transferred from PE 63739A, effective FY88.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improved training and operational effectiveness of weapon systems.

In FY88, specific accomplishments included: (a) validation of methods for predicting design-sensitive personnel requirements in Army weapon systems yet to be developed, (b) development and testing performance-based training concepts for the Army's Advanced Field Artillery System (AFAS), and (c) development of improved prototype methods for assessing soldier-machine command, control, communication and intelligence (C3I) performance at division and corps level.



## PROJECT OVERVIEW

		89	90
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PROJECT: A794	EDUCATION AND TRAINING	\$ 6.0M	\$ 3.6M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Project is to lead to theory-based training methods that produce more highly proficient soldiers without any increases in training resources (instructors, time, facilities, and travel).

This Project will experimentally investigate alternative methods for cost-effective application of computers and related electronic technology to training, with emphasis on: (a) individual combat, technical, and maintenance skills, (b) collective crew, team, and unit training, and (c) combined arms training methods focusing on the Reserve Components.

In FY89, plans include to: (a) develop programs for advanced rifle marksmanship using the low-cost Multiple Arcade Combat Simulator (MACS), (b) design and develop prototype commander's guide for more effective platoon-level National Training Center (NTC) performance measures, and (c) develop performance measures for Joint Readiness Training Center (JRTC).

In FY90, plans include to: (a) develop the methodology for estimating required Unit Tactical Performance at Combat Training Centers (CTC), and (b) develop guidance for improving NTC after action reports and take-home unit training packages.

This Project transferred from PE 63743A, effective FY88.

## PAYOFF/UTILIZATION:

The payoffs of this Project include reductions in training time, costs, facilities and travel while providing equally or more highly proficient soldiers.

In FY88, specific accomplishments included: (a) development of a prototype Special Forces Leader's guide, and (b) development of NTC Observer/Comptroller procedures guide for standardized data collection.

## PROJECT OVERVIEW

		89	90
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PROJECT: A795	TRAINING SIMULATION	\$ 5.0M	\$ 2.3M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Project is to provide the Army's Training and Doctrine Command (TRADOC) and the Project Manager for Training Devices (PMTRADE) with scientifically-based recommendations for the design of lower-cost, lower-complexity simulators and training devices, focusing on aviation, armor, and maintenance training.

The need for effective simulators and training devices is increasing in order to avoid the high cost of using actual equipment for training and to enable the Army to "train as it will fight".

In FY89, plans include to: (a) develop prototype tank gunnery training program using state-of-the-art computer generation imagery, (b) design and develop prototype unit-level threat training package for aviation night vision systems, and (c) perform training effectiveness evaluation of AH1S flight weapon simulators and live fire mix.

In FY90, plans include to: (a) validate tank gunnery training strategies, and (b) develop a modular flight simulator training effectiveness testbed.

This project was transferred from PE 63744A, effective FY88.

## PAYOFF/UTILIZATION:

The payoffs of this Project include to: (a) develop modern simulation and training technologies which can result in significant savings and improvements in flight, maintenance, and tactical training for units in the field, (b) give guidance to TRADOC and PMTRADE on their design of more cost-effective simulators and training devices, and (c) develop alternatives to high-cost, operational systems for training and maintaining the skills of a combat-ready force.

In FY88, specific accomplishments included: (a) development of the Artificial Intelligence (AI)-based HAWK radar maintenance tutor for use by Air Defense Artillery School, (b) identification of critical tasks and maneuvers performed by helicopter pilots not adequately trained by current simulators, (c) validation of a method to determine optimal mix of simulator and flying hours in primary flight training, and (d) obtainment of tank gunnery skill acquisition and retention curves for Unit Conduct-of-Fire-Trainer (U-COFT).

## PROJECT OVERVIEW

		89	90
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PROJECT: A796	HUMAN FACTORS ENGINEERING IN SYSTEMS DESIGN	\$ 0.0M	\$ 0.7M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY HUMAN ENGINEERING LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to transition results of human factors engineering (HFE) development efforts into the development of, and proof of concept for, methods, models, analysis tools, techniques, design guidelines, and nonsystem specific technology demonstrators for HFE integration throughout the combat development and weapon system design phases.

Rapid changes in technology, combined with increased emphasis on the physiological and associated psychological aspects of soldier-machine interface, i.e., ensuring that Army materiel can be effectively operated by soldiers in the field, have resulted in increasing demands for HFE expertise and the transfer of technology information into the materiel development and acquisition process.

In FY90, plans include the development of an HFE knowledge-based expert system which will assist the human factors engineer in the generation of HFE program requirements for system specifications, statements of work, data item descriptions, and contract data requirements. This system will result in more accurate and timely preparation of weapon system design documentation.

The Army Manpower and Personnel Integration (MANPRINT) program is geared to considering the soldier throughout the materiel acquisition process. This tool will facilitate the integration of HFE data into the design of an increased number of weapons systems without additional manpower costs.

## PAYOFF/UTILIZATION:

The payoff of this Project includes the support of all mission areas, and is focused primarily on addressing soldier-machine interactions.

This Project is a new start in FY90, after being deferred under Program Element 63736A.

## PROGRAM ELEMENT OVERVIEW

PE: 64715A                      NON-SYSTEM TRAINING DEVICES - ENGINEERING  
                                 DEVELOPMENT

CONGRESSIONAL CATEGORY:      SIMULATION & TRAINING DEVICES

DoD ORGANIZATION:            ARMY

FUNDING:                      FY89 \$ 21.8M (FY90 PRESIDENT'S BUDGET)  
                                 FY90 \$ 37.8M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to provide for engineering development of various Non-System Training Devices (NSTD) to support general military training and training on more than one item or system, rather than a single item or system.

Modern weapon systems are being integrated into the force at unprecedented rates, and the Army is faced with increased constraints on people, dollars, time, and real estate in a training environment where ammunition and fuel costs continue to rise. Training devices and training simulation provide force multipliers that can improve combat effectiveness by providing realistic training scenarios while helping to control rapidly escalating costs. Maintaining the combat effectiveness of Army personnel is the key to maintaining a ready force. This combat effectiveness can best be achieved by innovative, efficient, and results-oriented training. The major thrust in development of new training devices is to maximize the transfer of knowledge, skills, and experience from the training situation to a combat situation. Improved training devices, available through modern technology, must continue to be developed to provide the training required to prepare US soldiers to fight and defeat a numerically superior adversary.

The Projects within this Program Element were restructured in FY87 to reflect the close interrelationship between the efforts involved in the work of these Projects. Work previously planned to be associated with Projects D237 (NTSD - Artillery/Air Defense/Engineer), D239 (NSTD - Infantry), and D572 (NTSD - Armor/Anti-armor) have been combined with work planned under Project D241 (NSTD - Combined Arms) where all future work necessary will be funded. This restructuring reflects the true purpose of the NSTD program, which is to develop combined arms/multiple system training systems that are concerned with the collective unit mission proficiency, as opposed to system training devices, which are concerned with developing individual proficiency in the operation and maintenance of specific systems.

The work is performed by the Naval Training Systems Center.

## RELATED ACTIVITIES:

Program Element #0602727A (Non-System Training Device Technology); Program Element #0603738A (Non-System Training Devices - Advanced Development).

To preclude duplication of effort, this project is closely coordinated with other Services through Training and Personnel Technology Conferences, a Joint Service Technical Coordinating Group, worldwide staffing of Training Device Requirements, and collocation of the Project Manager for Training Devices with the Naval Training Systems Center (NTSC) and the Defense Training and Performance Data Center (TPDC) in Orlando, FL. There is no unnecessary duplication of effort within the Army or the Department of Defense.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include engineering development efforts for a variety of training devices and battle simulation systems which will provide realistic, effective, and economical training in marksmanship, gunnery, air defense, and nuclear, biological, and chemical (NBC) warfare.

FUTURE DIRECTIONS:

In FY91, plans for the Non-System Training Devices Combined Arms Project include: (a) completing development of the Sigint/EW Maintenance Trainer (SEMT), (b) continuing development of the Deep Battle Integration Training (DBIT) System, (c) continuing development of the Simulated Area Weapons Effects for Nuclear, Biological, Chemical System (SAWE-NBC IA), (d) initiating development of the Simulated Area Weapons Effects for Nuclear, Biological, Chemical for: Biological Agent Simulant/Biological Agent Delivery System (BAS/BADS), Chemical/Biological Agent Delivery System (CBADS), Infrared Defeat Smoke Simulators (IRDSS), Nuclear Weapons Effects Simulators (NWES), and Projected Smoke Simulators (PSS), (e) initiating development of the Brigade/Battalion Battle Simulation (BBS), and (f) initiating development of the Combined Arms Tactical Trainer For Close Combat Tactical Trainer (CCTT).

In FY91, plans for the Project Manager Training Devices and Naval Training Systems Center Support Project include to continue funding PM TRADE personnel and Naval Training Systems Center support.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: D241	NON-SYSTEM TRAINING DEVICES COMBINED ARMS	\$15.3M	\$29.2M
PE: 64715A	NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

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PROJECT SYNOPSIS:

The objective of this Project is to develop prototype training devices to support combined arms (Infantry, Armor, Aviation, Air Defense, Artillery, Engineer, Chemical, and support troops) training and multisystem training within the Army, including the Reserve Component.

The purpose of this Project is to improve the effectiveness and efficiency of Army training. This is done by developing training devices which facilitate the transfer to trainees of the knowledge, ability, and experience required to fight outnumbered and win on the modern battlefield (e.g., the Corps Battle Simulation is a command and control system used to train corps commanders, major subordinate commanders, major subordinate elements in the conduct of Deep Operations/Air Land battle operations, and Simulated Area Weapons Effects for Nuclear, Biological and Chemical which provides tactical engagement interface with Multiple Integrated Laser Engagement System and individual and unit training in various NBC-type environments.) Additionally, this project provides for the development of maintenance simulators such as the Signal Intelligence/Electronic Warfare Maintenance Trainer. This simulator will provide individual training for the maintenance of complex, computer based strategic signal intelligence systems. Devices developed under this project will enable the Army to train the collective unit to obtain the synergistic results which occur when a unit's weapons and support systems are employed in their respective battlefield roles. Utilizing modern technology, these devices will enhance training effectiveness while minimizing the requirements for scarce resources.

In FY89 it is planned to: (a) complete development of the Simulated Area Weapons Effects for Mine Effects Simulator (SAWE-MES), (b) continue development of the Deep Battle Integration Training (DBIT) System, (c) initiate development of the Simulated Area Weapons Effects for Nuclear, Biological, Chemical (SAWE-NBC I), (d) initiate development of the Sigint/EW Maintenance Trainer (SEWT), and (e) initiate development of the Simulated Area Weapons Effects for Indirect Fire-Global Positioning System (SAWE-GPS).

In FY90 it is planned to: (a) complete development of the SAWE-NBC I, (b) complete development of the SAWE-GPS, (c) continue development of the DBIT, (d) continue development of the SEMT, and (e) initiate development of the Simulated Area Weapons Effects for Nuclear, Biological, Chemical SAWE-NBC IA.

## PAYOFF/UTILIZATION:

The payoffs for this Project include: (a) training opportunities with less cost, which are more realistic and meaningful, (b) training conditions, which are safer while still providing high transfer of training to combat situations, and (c) increased ability to fight and defeat a numerically superior adversary.

In FY88, specific accomplishments included: (a) completing the development effort on the Sigint/EW Operator Simulator (SEOS), (b) completing the development effort on the Air Ground Engagement System (AGES), (c) completing the development effort on the Main Tank Gun Weapons Effects Signature (MTG WESS), (d) continuing the development effort on the Simulated Area Weapons Effects for Indirect Fire-Radio Frequency (SAWE-RF), (e) initiating the development effort on the Guard Unit Armory Device for Full Crew Interactive Simulation-Armor/Artillery (GUARDFIST), and (f) initiating the development effort on the Deep Battle Integration Training (DBIT).

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: D573	PROJECT MANAGER FOR	\$ 6.5M	\$ 8.6M
	TRAINING DEVICES AND		
	NAVAL TRAINING SYSTEMS		
	CENTER SUPPORT		
PE: 64715A	NON-SYSTEM TRAINING DEVICES - ENGINEERING		
	DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

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PROJECT SYNOPSIS:

The objective of this Project is to fund the support of Project Manager for Training Devices (PMTRADE) personnel and to fund a proportionate Army share of the operating costs of the Naval Training Systems Center (NTSC).

This Project provides the Army with a unique and specialized capability in all phases of research and development of cost-effective simulators for use as training devices to assure safe, economical, and effective training in establishing and maintaining the highest attainable degree of operational readiness. This arrangement is the result of an Interservice Support Agreement that is reviewed annually.

In FY89/90, it is planned to continue funding PMTRADE personnel and NTSC support.

## PAYOFF/UTILIZATION:

The payoff of this Project is that this arrangement makes available all Naval Training Systems Center (NTSC) resources for Army use.

These resources include: (a) over 800 civilian employees, of which almost 40 percent are professional personnel specializing in research, development, and training technology, and (b) extensive simulation facilities, including laboratories in areas such as physical sciences, electronics, visual simulation, computers, and human factors. Thus, the PMTRADE, collocated at NTSC with a limited number of Army personnel, performs a mission for the Army in the training area similar to those of development commands in other areas. Also, it includes contractual services for support which NTSC cannot provide due to manpower constraints.

FY88 accomplishments included: (a) funding support of PMTRADE personnel and a proportionate Army share of the operating costs of NTSC, and (b) annual review of the Interservice Support Agreement.



## PROGRAM ELEMENT OVERVIEW

PE: 64722A                      EDUCATION AND TRAINING SYSTEMS DEVELOPMENT  
CONGRESSIONAL CATEGORY:      EDUCATION & TRAINING  
DoD ORGANIZATION:            ARMY  
  
FUNDING:                      FY89 \$ 6.9M (FY90 PRESIDENT'S BUDGET)  
                                FY90 \$ 2.0M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to demonstrate the joint-Service effectiveness of advanced technology in education and training.

This Program Element responds to Congressional and Department of Defense (DoD) mandates for joint-Service demonstration and acquisition of emerging technologies that can be quickly prototyped and offered to the Services for education and training uses. This joint-Service Manpower and Training Technology Development (JSMTTD) program competitively selects Service and industry laboratory efforts of high potential for Service as well as other public and private sector implementation. This selection process enables the early identification of useful education and training technologies emerging from the Service R&D programs, aligns them with Service requirements and needs, and accelerates their demonstration and evaluation in both operational and institutional environments. The Army, under the direction of the Office of the Secretary of Defense, established this Program Element to accelerate the demonstration, evaluation, and transition of manpower-and-personnel-related tasks being developed in technology base R&D.

The executive agent is the US Army Research Institute for the Behavioral and Social Sciences.

## RELATED ACTIVITIES:

Coordination of this joint-Service program is assured through a joint-Service Committee that authorizes promising advanced Engineering Development products to be prototyped and tested. Task leaders for each proposed Project engineering development effort obtain written agreements with developers and operational users in two or more Services. Memorandums of Agreement (MOA) among Service laboratories and organizations participating in this program assure its coordination. Among the developing organizations are the following: Army Research Institute (ARI), the Naval Training Systems Center (NTSC), the Air Force Human Research Laboratory (AFHRL), the Navy Personnel R&D Center (NPRDC), the Army Program Manager for Training Devices (PM TRADE), the Naval Weapons Center (NWC) and the Defense Training Performance and Data Center (TPDC).

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) improved skill levels of maintenance personnel, (b) reduced burden for Service training, (c) reduced training costs, and (d) improved cost savings through implementation of developments from this Program Element by multiple Services, eliminating parallel developments, and achieving economies of scale through joint-Service procurement of hardware and software training support.

Advanced training methods, simulators, and training devices using state-of-the-art information technology, reduce the heavy personnel requirements of Service training, while maintaining or increasing the effectiveness of training. The Personalized Aid for Electronic Maintenance (PEAM), for example, is expected to reduce errors in field maintenance tasks

by 20 percent and will completely replace paper-based organizational maintenance manuals. A Computerized Hand-held Instructional Prototype (CHIP) can be used in units for training in procedural skills in a variety of Military Occupational Specialties (MOSs), and it will enable training to be completely personalized and self-paced.

#### FUTURE DIRECTIONS:

In FY91, plans for the Education and Training Systems Development Project include development, test/evaluation, and transition of: (a) a resident instruction database to permit course data to be interchanged among the Services, (b) a Service School Course Data Exchange System that provides for interservice storage and access of formal school course information, and (c) an Instructional Technology Database providing a centralized DoD repository for automated instructional delivery systems.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: D750	EDUCATION AND TRAINING	\$ 6.9M	\$ 2.0M
	SYSTEMS DEVELOPMENT		
PE: 64722A	EDUCATION AND TRAINING SYSTEMS DEVELOPMENT		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

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PROJECT SYNOPSIS:

The objective of this Project is to provide demonstrations of joint Army, Navy, Air Force, and Marine Corps prototype, technology-based, training and job-aiding devices that will meet the Services' most pressing training problems.

The Services must deal with training problems due to fewer available personnel, lower verbal and mathematical skills of entry-level personnel, more numerous and complex weapon systems, and rapidly increasing training costs. The House Armed Services Committee requested that the Services apply more research and development funds to joint-Service developmental and demonstration projects. In October 1981, a Program Decision Memorandum from the Office of the Secretary of Defense directed the Army to establish a joint-Service program to identify high-payoff, technology-based instructional methods resulting from defense and civilian research and development, and to demonstrate their use in full-scale prototypes for training, education areas, and job performance aids.

In FY89 it is planned to: (a) assess the utility and benefits for a Computerized Hand-held Instructional Prototype (CHIP) for joint-Service applications, (b) evaluate a prototype automated system for estimating training simulator effectiveness and transition to developers/users, (c) develop a prototype and demonstrate an "intelligent" conduct-of-fire trainer, (d) demonstrate and transition a prototype database to manage training space utilization in the Continental US, and (e) demonstrate a method for automating transportable resident technical instruction for use by courseware users.

In FY90 it is planned to develop, test/evaluate and transition: (a) a portable, computer-based system to present technical instruction outside school settings, and (b) a prototype portable job aid that presents data for identifying munitions and procedures for rendering these munitions "safe".

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) more effective military job performance, (b) less reliance on institutional training, (c) reduced requirements for training support personnel, and (d) more efficient and effective production, delivery, and management of computer-based training materials for all the Services.

In FY88, specific accomplishments included: (a) completing development, demonstration, and test of the prototype Personalized Aid for Electronic Maintenance, (b) developing the prototype design for a portable, computerized system for presenting technical instruction outside the school setting, (c) demonstrating a training aid for tactical radar interceptor operators, (d) demonstrating, and readying the joint-Service transition, a prototype training equipment database, (e) developing and demonstrating a new

RDTE-program financial tracking system, and (f) initiating five new tasks as part of this 6.4 Program's requirement to undertake development of promising technologies for rapid prototyping, test, and transition.

## PROGRAM ELEMENT OVERVIEW

PE: 64801A AVIATION ENGINEERING DEVELOPMENT  
 CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES  
 DoD ORGANIZATION: ARMY  
 FUNDING: FY89 \$ 7.2M (FY90 PRESIDENT'S BUDGET)  
 FY90 \$ 11.7M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this Program Element is to support aviation engineering developments associated with Synthetic Flight Training Systems (SFTS), Aviation Life Support Equipment (ALSE), and Aviation Non-Systems Training Devices.

SFTS is a project that supports development of a family of high-fidelity flight, weapon, and mission helicopter simulators to support initial entry helicopter pilot training, transition training, and combat operational training.

ALSE makes the integrated battlefield/worldwide environmental survivability possible, and emphasizes enhancing the air crews' ability to return to fight again, through new protective clothing ensembles, aviator protective masks, laser protective visors, survival kits, restraint systems, integrated flight helmets, and microclimate cooling devices.

The Aviation Non-System Training Devices Project supports development of aviation training devices that are applicable to more than one aviation system. This Program Element was transferred from PE 64217A, effective FY88.

The in-house developing organization responsible for this program is the Defense Advance Research Projects Agency.

## RELATED ACTIVITIES:

Aviation Life Support Equipment programs are coordinated through several tri-Service and allied working groups and steering committees; appropriate Army, Air Force, and Navy development commands; and aircraft PMs in order to prevent duplication of effort and ensure proper priority of efforts. For coordination of training device technology with the Air Force and the Navy, the Army Project Manager for Training Devices is located at the Naval Training Systems Center and has an Air Force liaison officer. Program Elements 0603003A (Aviation Advanced Technology) and 0602727A (Non-System Training Devices Technology) perform flight simulation component research and development. Many joint projects are effected between the Services to prevent duplication of in-flight simulator development efforts.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) a reduction in operations and support cost, and (b) a better-trained pilot.

The simulators are used to complement the training accomplished in actual aircraft during formal courses of instruction and for maintenance of combat readiness by rated aviators. Each hour flown in a simulator offsets an hour which would have been flown in an aircraft. An hour in an AH-64 aircraft will cost approximately \$3000, while the simulator will cost less than \$600 per hour. Each simulator will be used 3645 hours per year, and therefore, each simulator reduces annual operations and support cost by \$8,748,000 (3000-600=2400x3645), while concurrently providing a better trained pilot.

The reduction in operations and support cost is included in the Army's flying hour program request.

FUTURE DIRECTIONS:

In FY91, plans for the Synthetic Flight Training System Project include continuing flight simulator upgrades to ensure the same configuration as operational aircraft.

In FY91, plans for the Aviation Non-System Training Devices Project include completing full-scale engineering development on the Aviation Network (AIRNET).

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: D275	SYNTHETIC FLIGHT	\$ 4.4M	\$ 7.4M
	TRAINING SYSTEMS		
PE: 64801A	AVIATION ENGINEERING DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

-----  
PROJECT SYNOPSIS:

The objective of this Project is to develop a family of high-fidelity, operational flight weapon and combat mission helicopter simulators to support initial entry helicopter pilot training, transition training, and combat operational training.

A major thrust is the development of a simulation of the combat environment for tactical flight, including nap-of-the-earth (NOE), weapons engagement, and enemy interaction, to provide realistic and cost-effective training in a totally safe environment. The simulators complement the training accomplished in actual helicopters during formal courses of instruction and maintain combat readiness of rated aviators. Each simulator is a replica of the helicopter cockpit, mounted on a motion system, plus an instructor's station with the equipment necessary for the instructor to control the training scenario, the operating environment, and the measurement of the pilot's performance. Each simulator has a visual system to provide the aircrew with a view of the terrain outside the helicopter.

In FY89/90 it is planned to continue flight simulator upgrades to ensure the same configuration as operational aircraft.

## PAYOFF/UTILIZATION:

The payoff of this Project is considerable cost savings utilizing the AH-64 Combat Mission Simulator, which will be the first training simulator capable of simulating the full combat mission, including hostile enemy interaction.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: DE70	AVIATION NON-SYSTEM TRAINING DEVICES	\$ 2.8M	\$ 4.3M
PE: 64801A	AVIATION ENGINEERING DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

-----  
PROJECT SYNOPSIS:

The objective of this Project is to develop aviation training devices that are applicable to more than one aviation system or are applicable to no major aircraft or aviation system.

In FY89, it is planned to: (a) continue full-scale engineering development of the Aviation Network (AIRNET), and (b) continue full scale development on the Aviation Combined Arms Tactical Trainer (AVCATT).

In FY90, it is planned to continue: (a) full-scale development of AIRNET, and (b) complete development of the AVCATT.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) capabilities for improved team training and (b) growth capabilities for future weapons systems as a result of using a modular approach in development.

The AVCATT will also be capable of simulating full combat mission and combat integration of Scout and Attack aircrews under all environmental conditions (i.e., day, night, adverse weather, full weapons effects and nap-of-the-earth flight).

In FY88, specific accomplishments included: (a) continuing full-scale engineering development of the Aviation Network (AIRNET), and (b) continuing full scale engineering development on the Aviation Combined Arms Tactical Trainer (AVCATT).



### III-A-1: LISTING OF ARMY PROJECTS

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS .

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62716A						HUMAN FACTORS ENGINEERING TECHNOLOGY
AIQL	HEL	7.144	0.000	HF	V A R	ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)
AH70	HEL	7.859	14.894	HF	4	HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT
		----- 15.003	----- 14.894			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62716A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	----- 15.003	----- 14.894

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62727A						NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY
A230	PMTRADE	3.429	4.424	ST	6	NON-SYSTEM TRAINING DEVICES
		-----	-----			
		3.430	4.425			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62727A :						FY89      FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						-----      -----
						3.429      4.424

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ET	ARI	1.005	0.000	ET	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-HF	ARI	2.011	0.000	HF	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-MP	ARI	2.370	0.000	MP	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-ST	ARI	1.795	0.000	ST	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A790-HF	ARI	2.708	2.300	HF	4	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
A790-ST	ARI	2.417	2.056	ST	6	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
A791-ET	ARI	1.524	3.592	ET	6	MANPOWER, PERSONNEL AND TRAINING
A791-MP	ARI	3.909	9.102	MP	2	MANPOWER, PERSONNEL AND TRAINING
		----- 17.740	----- 17.051			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						FY89 ----- 17.739
THE PRESIDENT'S BUDGET, JANUARY 1989						FY90 ----- 17.050

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A792	ARI	9.908	6.499	MP	2	MANPOWER AND PERSONNEL
A793	ARI	8.322	5.900	HF	4	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS
A794	ARI	5.985	3.560	ET	6	EDUCATION AND TRAINING
A795	ARI	4.983	2.306	ST	6	TRAINING SIMULATION
A796	HEL	0.000	0.700	HF	4	HUMAN FACTORS ENGINEERING IN SYSTEMS DESIGN
		-----	-----			
		29.199	18.966			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63003A						AVIATION ADVANCED TECHNOLOGY
DB34	AVSCOM	4.035	3.152	ST	6	ROTORCRAFT SYSTEM INTEGRATION SIMULATOR (RSIS)
DB39	PMTRADE	1.344	0.870	ST	6	FLIGHT SIMULATOR COMPONENTS
		-----	-----			
		5.379	4.023			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63003A :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715A						NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT
D241	PMTRADE	15.251	29.198	ST	6	NON-SYSTEM TRAINING DEVICES COMBINED ARMS
D573	PMTRADE	6.539	8.568	ST	6B	PROJECT MANAGER FOR TRAINING DEVICES AND NAVAL TRAINING SYSTEMS CENTER SUPPORT
		-----	-----			
		21.791	37.766			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64715A :						FY89      FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						----- 21.790      37.766

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### III-A-1: LISTING OF ARMY PROJECTS

(CONTINUED)



(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
64801A					AVIATION ENGINEERING DEVELOPMENT
D275	PMTRADE	4.389	7.413 ST	6D	SYNTHETIC FLIGHT TRAINING SYSTEMS
DE70	PMTRADE	2.785	4.286 ST	6D	AVIATION NON-SYSTEM TRAINING DEVICES
		----- 7.175	----- 11.700		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64801A :					
					FY89      FY90
					-----      -----
					THE PRESIDENT'S BUDGET, JANUARY 1989      7.174      11.699

### III.B. NAVY PROGRAM ELEMENT AND PROJECT SYNOPSIS

PE	TITLE	PAGE
61153N	DEFENSE RESEARCH SCIENCES	III-B-1
62131M	MARINE CORPS LANDING FORCE TECHNOLOGY	III-B-6
62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA	III-B-8
62234N	SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA	III-B-14
63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT	III-B-18
63707N	MANPOWER AND PERSONNEL SYSTEMS DEVELOPMENT	III-B-21
63720N	EDUCATION AND TRAINING	III-B-23
63732M	MARINE CORPS ADVANCED MANPOWER TRAINING SYSTEMS	III-B-26
63733N	SIMULATION AND TRAINING DEVICES TECHNOLOGY	III-B-28
63739N	NAVY LOGISTICS PRODUCTIVITY	III-B-31
64703N	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS	III-B-36
64715N	SURFACE WARFARE TRAINING DEVICES	III-B-38

Table III-B-1: Listing of Projects - Lists projects for each NAVY program element. Lists contain performing organization, funding, Congressional Category and goal information.

III-B-i

## PROGRAM ELEMENT OVERVIEW

PE: 61153N DEFENSE RESEARCH SCIENCES, SUBELEMENT 42:  
BEHAVIORAL AND ORGANIZATIONAL SCIENCES

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING  
HUMAN FACTORS  
MANPOWER & PERSONNEL

DoD ORGANIZATION: NAVY

FUNDING: FY89 \$ 11.5M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 14.1M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to sustain U.S. Naval scientific and technological superiority and to be a source of new concepts and technological options for the maintenance of naval power and national security.

The objectives of the MPT Subelement are to develop fundamental knowledge about human capabilities and characteristics, which support and guide Navy and Marine Corps efforts to improve: (a) personnel selection and classification, (b) training, (c) equipment design for ease of human use and maintenance, (d) team composition, (e) leadership, and (f) group decision-making procedures.

Major areas are: (a) Personnel and Training, which includes research on: (1) psychological measurement for selection, classification, and training, (2) human learning and instructional processes, and (3) the cognitive and neural bases of skill and knowledge acquisition, (b) Engineering Psychology, which covers research on basic human performance (such as inference, judgment, decision-making, auditory and visual perception, and system control) and on factors underlying the design of human-compatible interfaces in high technology systems, and (c) Group Psychology, which focuses on group processes, group behavior, leadership, and other factors that determine the productivity, morale, and retention of personnel. Research approaches include theoretical formulations, laboratory and simulator experimentation, mathematical modeling, correlational analyses, and observation and measurement in operational settings.

Research results from the program impact: (a) the design of Navy systems such as the Computerized Adaptive Testing version of the Armed Services Vocational Aptitude Battery, (b) classroom training programs that incorporate intelligent automated tutors, (c) input/output interfaces between men and machines that include automated speech recognition systems, (d) programs for supervisory control of remotely operated underwater vehicles and manipulators, and (e) organizational arrangements and decision protocols for future command and control systems.

Within ONR this Subelement coordinates with Biological Sciences, Information Sciences, and Mathematics Divisions in several interdisciplinary programs. Coordination with basic research sponsoring agencies within DoD is maintained through reviews for the Office of the Under Secretary of Defense for Research and Engineering, through joint-Service Technical Advisory Groups and through the NRC Committee on Human Factors sponsored by elements of Army, Navy, Air Force, NASA and NSF. International coordination is effected through NATO panels and the Technical Cooperation Program.

## RELATED ACTIVITIES:

All research activity undergoes formal coordination through reviews by the Office of Under Secretary of Defense for Research and Engineering, through active Navy and Marine Corps participation in interagency committees, and

through interaction with the scientific community. Coordination and review mechanisms can be either common or specific to program subelements and, where significant, are described under the appropriate subelement in Paragraph H.

The work is performed by the Office of Naval Research (Defense Research Sciences Element). The performers include various university, industry, not-for-profit institutions and Navy laboratories. About 53 percent of funding goes to universities, 36 percent to Navy laboratories and 11 percent to industrial and other sources.

#### PAYOFF/UTILIZATION:

The payoffs of this Subelement include research support for: (a) advanced training technology by the Navy training community, (b) operational man-machine systems, and (c) manpower and personnel policies and practices which affect recruitment, retention, and productivity.

This research effort is the primary means for determining scientific understanding and the needed technologies underlying improvements in Navy capabilities and operations. Increased research is needed to reach technological parity in some areas and gain/maintain superiority in others. Research is directed to search out, assess, and exploit potential solutions to naval problems.

Progress made in the areas of personnel and training research, engineering psychology, and group psychology include: (a) development of methods of modeling human performance on psychological tests that will reduce the cost and improve the quality of test calibration, (b) the discovery of differences in problem-solving strategies of low- and high-spatial ability persons, enabling the design of better aptitude tests, (c) improved understanding of observer judgments of object orientation and directionality in 3-D space, (d) development of a new metric for describing color space which will improve the design of multicolor displays, (e) development of an innovative conceptualization of the processes and contexts which determine the effectiveness of industrial, commercial, and government organizations, and (f) creation of a theoretical framework for understanding the processes whereby high school students learn to adapt, or fail to adapt, to school requirements and to work rules after leaving school (including military service).

#### FUTURE DIRECTIONS:

The FY 89 Program will tie all research in psychological processes more strongly to appropriate areas of neuroscience, particularly to the areas of attentional, perceptual, and cognitive processes.

## PROJECT OVERVIEW

	89	90
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PROJECT: RR04206	PERSONNEL AND TRAINING	\$ 6.3M \$ 7.7M
PE: 61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES	
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING	
DoD ORGANIZATION:	NAVY	
RESPONSIBLE ORGANIZATION:	OFFICE OF NAVAL RESEARCH	

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PROJECT SYNOPSIS:

The objective of this Project is to begin theoretical work toward estimating complex abilities from multidimensional tests.

Cognitive processes research will emphasize dynamic changes in knowledge representation as a novice learner progresses toward expert level skill, and learning and training research will begin to include social and motivational factors in transitioning from traditional classroom instruction to learning environments with advanced technologies such as intelligent tutor systems.

## PAYOFF/UTILIZATION:

The payoff of this Project includes the solution of many training problems in the Navy through the introduction of more individualized, automated, and simulator-based instruction.

## PROJECT OVERVIEW

		89	90
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PROJECT: RR04208	GROUP PSYCHOLOGY	\$ 2.8M	\$ 3.4M
PE: 61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	OFFICE OF NAVAL RESEARCH		

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## PROJECT SYNOPSIS:

The objective of this Project is to increase understanding of the psychological and organizational variables that determine the performance of individuals, groups, teams, and units in the Navy and Marine Corps.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improved quality of Navy and Marine Corps personnel, reduction of personnel attrition and losses of Petty Officers in shortage categories, and enhanced effectiveness of military and civilian employees.

## PROJECT OVERVIEW

		89	90
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PROJECT: RR04209	ENGINEERING PSYCHOLOGY	\$ 2.4M	\$ 3.0M
PE: 61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	OFFICE OF NAVAL RESEARCH		

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## PROJECT SYNOPSIS:

The objective of this Project is the development of enhanced group decision-making procedures.

## PAYOFF/UTILIZATION:

The payoff of this Project will be improved human performance in high technology systems to meet Navy and Marine Corps operational requirements.

## PROGRAM ELEMENT OVERVIEW

PE: 62131M MARINE CORPS LANDING FORCE TECHNOLOGY  
 CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL  
 DoD ORGANIZATION: MC  
 FUNDING: FY89 \$ 0.5M (FY90 PRESIDENT'S BUDGET)  
 FY90 \$ 0.5M (FY90 PRESIDENT'S BUDGET)

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PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element (PE) is to develop managerial and statistical concepts and techniques that will lead to more cost-effective personnel and training management policies and procedures.

This Program Element is the only DoD program that develops the technologies needed to support unique Marine Corps expeditionary force requirements. Mission needs are derived from specific threat capabilities and the requirement to operate in a variety of climates and tactical scenarios worldwide, including the conduct of amphibious operations.

Efforts will focus on: (a) developing faster, more accurate assessment of individual aptitudes and abilities, (b) improving personnel retention, (c) reducing short-term personnel transfers, (d) developing low-cost training simulators, (e) developing training standards for all unit levels, and (f) developing an improved, less manpower-intensive procedure to match training to job requirements.

To avoid duplication of work, close coordination is maintained with all the other Armed Services and selected DoD agencies, the National Aeronautics and Space Administration (NASA), and Industrial Research and Development (IR&D) Projects. The Marine Corps Manpower and Training Technology area includes: PE 62722A (Manpower, Personnel and Training), PE 63743A (Education and Training), PE 63732M (Marine Corps Manpower and Training Systems), Joint-Service Job Performance Measurements Working Group, Computerized Adaptive Testing Interservice Coordinating Committee, and PE 62233N (Mission Support Technology).

The work is performed by the Naval Ocean Systems Center, Naval Coastal Systems Center, Naval Surface Warfare Center, David Taylor Research Center, Naval Civil Engineering Laboratory, Naval Weapons Center, Navy Personnel Research and Development Center, and Naval Research Laboratory.

This Technology Area Subsumes efforts transferred from Program Element 62744N, under Projects F44-521 and F44-522.

## PAYOFF/UTILIZATION:

The payoffs of the MPT portion of this Program Element are improved utilization and increased readiness of personnel through: (a) more accurate assessment of individual aptitudes and abilities, (b) improved personnel retention, (c) reduced short-term personnel transfers, (d) the development of low-cost training simulators, (e) better training standards from all unit levels, and (f) improved, less manpower-intensive procedures for matching training to job requirements.

## FUTURE DIRECTIONS:

Beyond FY90, it is planned to continue to pursue manpower management and forecasting technology.



## PROJECT OVERVIEW

		89	90
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PROJECT: CF31P14	MARINE CORPS MANPOWER & TRAINING TECHNOLOGY	\$ 0.5M	\$ 0.5M
PE: 62131M	MARINE CORPS LANDING FORCE TECHNOLOGY		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	MC		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Subproject is to develop managerial and statistical concepts and techniques that will lead to more cost-effective personnel management policies and procedures through focusing on: (a) faster, more accurate assessment of individual aptitudes and abilities (a joint-Services project), (b) improvement of personnel retention, and (c) reduction of short-term personnel transfers.

In FY89, it is planned to perform data collection analysis on stress and fatigue-related tasks and their application to military job assignments.

In FY90, it is planned to: (a) continue acceptance testing of tour optimization system, and (b) commence assessment of technology to develop a force manpower management and personnel forecasting system.

This Subproject was transferred in FY85 from Program Element (PE) 62744N, Marine Corps Air-Ground Technology, to the current Program Element as part of the Marine Corps Manpower and Training technology area.

## PAYOFF/UTILIZATION:

The payoff of this Subproject is improved utilization of personnel and thus increased readiness through: (a) more accurate assessment of individual aptitudes and abilities, (b) improved personnel retention, and (c) reduced short-term personnel transfers.

In FY88, specific accomplishments included testing of personnel and assessment of data related to identifying stress and fatigue tasks.

## PROGRAM ELEMENT OVERVIEW

PE: 62233N                    MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING  
AND SIMULATION TECHNOLOGY AREA

CONGRESSIONAL CATEGORY:    MANPOWER & PERSONNEL  
EDUCATION & TRAINING  
SIMULATION & TRAINING DEVICES

DoD ORGANIZATION:           NAVY

FUNDING:                    FY89 \$ 6.7M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 7.0M (FY90 PRESIDENT'S BUDGET)

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PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to provide mission support technologies essential for all naval operations, specifically through the support of effective recruitment, training, and retention of military personnel and the development of training device simulation technology.

This Program Element provides mission support technologies essential for all naval operations. Personnel and training technologies enhance the Navy's ability to select, assign and train people for highly demanding jobs. Biomedical technologies improve the medical care delivery system and enhance performance capabilities under adverse conditions. Logistics technologies increase operational readiness through effective management and movement of supplies ashore and at-sea, improve fuel procurement specifications, and advance techniques for more cost effective construction and maintenance of shore and off-shore facilities. Environmental protection technologies address Navy-unique issues in air and water quality and toxic waste. Chemical/Biological/Radiological Defense (CBR-D) technologies improve the ability to respond to existing and future CBR-D threats.

The work is performed by the Naval Air Propulsion Center, Naval Coastal Systems Center, Navy Personnel Research and Development Center, Naval Training Systems Center, Naval Medical Research and Development Command Laboratories, Naval Air Development Center, Naval Clothing and Textile Facility, David Taylor Research Center, Naval Civil Engineering Laboratory, Naval Surface Warfare Center, Naval Research Laboratory, and the Naval Ocean Systems Center.

## RELATED ACTIVITIES:

Efforts are in consonance with progress in other Services and are coordinated through informal exchanges of information as well as formal Technical Advisory Groups, Working Groups, Committees, Joint Memoranda of Understanding and/or joint-Service Agreements. Also, Program Elements 63733N, Simulation and Training Devices; 64714N, Air Warfare Training Devices; 64715N, Surface Warfare Training Devices.

## PAYOFF/UTILIZATION:

The payoffs of the MPT portion of this Program Element are more effective recruitment, training, and retention of military personnel.

## FUTURE DIRECTIONS:

Beyond FY90, for the Manpower and Personnel Technology Subproject, it is planned to initiate field evaluation of mission-specific performance enhancement interventions developed for the naval special warfare community.

Beyond FY90, for the Instructional Technology Project, it is planned to: (a) complete evaluation of a prototype intelligent training system which improves the allocation of functions between human and computer, (b) complete all computer assisted diagnostic programs for use in a submarine environment, and (c) complete operational evaluations of embedded training technology for shipboard training and skill maintenance.

Beyond FY90 for the Simulation and Training Device Technology Subproject, it is planned to complete development of acoustic simulation technology for training under-ice navigation, target acquisition and weapon delivery.

## PROJECT OVERVIEW

		89	90
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PROJECT: RM33M20	MANPOWER AND PERSONNEL TECHNOLOGY	\$ 2.6M	\$ 2.7M
PE: 62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Subproject is to: (a) improve accessioning and recruiting techniques, (b) improve the quality and retention of personnel, (c) improve the fit between personnel and jobs, (d) enhance the motivation and productivity of personnel, and (e) increase the effectiveness of managers and policy makers by giving them better tools for measuring and predicting the consequences of their decisions.

In FY89 it is planned to complete development of measures which predict officer leadership abilities, for use in selecting Naval Academy midshipmen.

In FY90 it is planned to complete evaluation of techniques for training and evaluating the performance of Naval combat teams.

This Subproject was transferred in FY85 from Program Element 62763N, Project F63-521, to the current Program Element as part of the Personnel, Training and Simulation Technology Area.

## PAYOFF/UTILIZATION:

The payoffs of this Subproject include improved recruitment and retention of military personnel.

In FY88, accomplishments included: (a) development of a more powerful Navy Reserve Officers Training Corps selection system, (b) design of a computerized spatial abilities test and a working memory test, (c) transitions to the Enlisted Personnel Allocation and Nomination System (EPANS), and (d) development of automated methods for validating the forecasting accuracy of several operational Navy personnel planning models (e.g. STRAP-0, FAST).

## PROJECT OVERVIEW

		89	90
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PROJECT: RM33T21	INSTRUCTIONAL TECHNOLOGY	\$ 1.5M	\$ 1.5M
PE: 62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objectives of this Project are to improve the Navy's ability to train personnel effectively, rapidly, and economically. These objectives correspond to training system technology goals, as stated in the FY89/90 Mission Area Strategy for Mission Support, such as reducing instructor manning requirements with the aid of expert systems.

These objectives will be met by developing state-of-the-art technology for: (a) computer-based intelligent training systems, (b) communication and problem solving skills, (c) individual and group performance measurement, and (d) cost-effective simulators and training devices.

The specific tasks within this Project that will meet the project objectives include: (a) chemical warfare defense training, (b) aircrew coordination, (c) maintenance technology, (d) embedded training technology identification and development, (e) knowledge acquisition for expert systems, (f) team training and performance measurement issues, and (g) the simulation fidelity design guide.

In FY90 it is planned to complete evaluation of techniques for training and evaluating the performance of Naval combat teams.

## PAYOFF/UTILIZATION:

The payoffs of this Project will be training for Navy personnel that is cost-effective, expedient and efficient, and the development of state-of-the-art technology in several training areas.

In FY88, specific accomplishments included: (a) developing Chemical, Biological, and Radiological Defense (CBR-D) common skills pocket guides and evaluating their effectiveness by Fleet Training Group (FTG) Pearl Harbor, (b) devising an improved film segment to enhance tear gas chamber mask drill exercise for recruits, (c) conducting a pilot experiment to more closely examine the concentric and landmark methods of cue presentation in addition to level of graphics detail, (d) modifying candidate technologies for inclusion in embedded operator and team training systems, (e) implementing a prototype concept demonstration system which provides a direct manipulation graphics interface for inputting task knowledge, (f) providing a developmental framework to present the requirements of operational training systems, and (g) applying Simulator Sickness task research data which has resulted in specifications for the V-22 simulators, which will be the Marine Corps' number one simulator priority.

## PROJECT OVERVIEW

		89	90
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PROJECT: RM33T23	EDUCATION AND TRAINING TECHNOLOGY	\$ 1.4M	\$ 1.5M
PE: 62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Subproject is to support effective training of military personnel.

Increasing demands on career enlisted personnel to meet end strengths for the 600-ship Navy will put pressure on shore assignments in Navy training, and particularly, on instructor billets. The Training Systems Project brings technology to bear on reducing the personnel intensive character of Navy training.

In FY89, it is planned to complete evaluation of artificial intelligence applications to a maintenance training course for the SH-3H helicopter.

In FY90, it is planned to improve calibration techniques for computer-administered test items used to select and assign applicants for military service.

This Subproject was transferred in FY85 from Program Element 62763N, Project F63-522, to the current Program Element as part of the Personnel, Training and Simulation Technology Area.

## PAYOFF/UTILIZATION:

The payoffs of this Subproject include more effective training of military personnel.

In FY88, specific accomplishments included: (a) development of recommended changes in the Chemical, Biological, Radiological Defense Training provided at the schools under the Chief of Naval Education and Training, and (b) production of a gaming approach that will improve the level of persistence on computer-based instruction by Navy students.

## PROJECT OVERVIEW

		89	90
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PROJECT: RM33T24	SIMULATION AND TRAINING DEVICE TECHNOLOGY	\$ 1.1M	\$ 1.2M
PE: 62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objectives of this Subproject are to develop and demonstrate the feasibility of technologies for improving the training effectiveness and reducing the cost of simulation systems in training devices. These objectives correspond to training system technology goals, as stated in the FY89/90 Mission Area Strategy for Mission Support, such as simulating advanced sensor system displays and ASW simulation.

In FY89, it is planned to complete the feasibility demonstration of millimeter wave simulation techniques for tactical training.

This Subproject was transferred in FY85 from Program Element 62757N, Project F57-526, to the current Program Element as part of the Personnel, Training and Simulation Technology Area.

## PAYOFF/UTILIZATION:

The payoffs of this Subproject include more effective training of military personnel through the provision of advanced training simulation devices.

In FY88, specific accomplishments included: (a) completing development of simulation techniques for training Inverse Synthetic Aperture Radar (ISAR) target recognition skills, and (b) developing mathematical models to represent the operation of a high frequency sonar system for under-ice piloting.

## PROGRAM ELEMENT OVERVIEW

PE: 62234N                      SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS  
                                  TECHNOLOGY AREA

CONGRESSIONAL CATEGORY:      HUMAN FACTORS

DoD ORGANIZATION:            NAVY

FUNDING:                      FY89 \$ 4.2M (FY90 PRESIDENT'S BUDGET)  
                                  FY90 \$ 4.3M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to provide Navy systems developers with the resources and expertise to implement advanced concepts, specifically in the areas of man-machine interface, decision-making, and information transfer.

This Program Element comprises a broad technology base program to provide the Navy with the capability, resources, and expertise to implement advanced weapon system concepts. The materials and electronic devices topics address fundamental limitations in terms of performance, reliability and cost in order to accelerate transition of advanced technology to fleet use. Computer Technology addresses hardware and software development issues and supports advanced concepts in Artificial Intelligence technology. The Human Factors topic addresses high-payoff technological opportunities in man-machine interface, decision making and information transfer.

The Biopsychometric Assessment Project will address human performance limitations such as failure to detect, identify, classify and appropriately respond to enemy targets by developing technologies for assessing real time operator performance using direct brain processing techniques. It seeks to develop a methodology to predict operator failure and thereby minimize operator error.

This Technology Area subsumes Human Factors Projects transferred from Program Element 62757N. Funding indicated includes only the MPT portion of this Program Element.

The work is being performed at the Naval Civil Engineering Lab, David Taylor Research Center, Naval Air Development Center, Naval Air Propulsion Center, Naval Ocean Systems Center, Naval Research Lab, Naval Surface Warfare Center, Naval Weapons Center, Naval Avionics Center, Navy Personnel Research and Development Center, Navy Health Research Center, and Naval Aerospace Medical Research Laboratory.

## RELATED ACTIVITIES:

This program works closely with the Program Elements 602111N (AAW/ASUW Technology) and 0603270N (Electronic Warfare Technology) to provide needed experimental sensor devices, power sources, and special processing chips. The materials efforts are closely coordinated with Program Elements 0602121N (Surface Ship Technology), 0602122N (Aircraft Technology) and 0602323N (Submarine Technology), and provide an array of new structural materials to satisfy new mission requirements. Computer Technology is closely coordinated with Program Elements 0602232N (Command, Control and Communications Technology), 0602111N, 0603270N and 0602314N (ASW Technology). A significant cooperative effort is being jointly pursued with PE 0603792N (Advanced Technology Transition) to develop Ultra-Low Loss Fiber Optic cables for Anti-Submarine Warfare applications.



PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Program Element is the provision to Navy systems developers of resources and expertise in the areas of man-machine interface, decision-making, and information transfer, thus enabling improved system design with better utilization of the human component.

In FY88, specific accomplishments included: (a) development of a more powerful Navy Reserve Officer Training Corps, (b) design of a computerized spatial abilities test and a working memory test, (c) transitions to the Enlisted Personnel Allocation and Nomination System (EPANS), and (d) development of a method for estimating the cost of forecast error in Navy personnel planning.

FUTURE DIRECTIONS:

Beyond FY90, it is planned to: (a) complete evaluation of heads-up display formats to prevent loss of situational awareness (spatial disorientation) in fighter and attack pilots, (b) complete development and demonstration of advanced concepts for user-computer interfaces for shipboard combat direction systems, and (c) perform validation of biopsychometric technology in operational or quasi-operational environments.

## PROJECT OVERVIEW

		89	90
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PROJECT: RS34H20	HUMAN FACTORS TECHNOLOGY	\$ 3.6M	\$ 3.7M
PE: 62234N	SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL OCEAN SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objective of this Subproject is to provide Navy systems developers with the resources and expertise to implement advanced concepts, by addressing technological opportunities in man-machine interface, decision-making, and information transfer.

This Subproject subsumes efforts transferred from Program Element 62757N, under Projects F57-242 and F57-525.

In FY89, it is planned to: (a) demonstrate an integrated Software Engineering Environment capability using Ada language system facilities, and (b) complete laboratory evaluation of a decision support system to assist antisubmarine warfare tacticians in integrating information from multiple sources.

In FY90, it is planned to: (a) demonstrate integration of software tools into a functional software engineering environment, and (b) complete development of a prototype decision aid to assist submarine approach officers to develop an accurate understanding of the current three-dimensional ASW tactical situation.

## PAYOFF/UTILIZATION:

The payoff of this Subproject is the provision to Navy systems developers of resources and expertise in the areas of man-machine interface, decision-making, and information transfer, thus enabling improved system design with better utilization of the human component.

In FY88, specific accomplishments included the completion of the shipboard evaluation of intelligent decision aiding technology with emphasis on weapons allocation for air strike planning.

## PROJECT OVERVIEW

		89	90
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PROJECT: RS34H21	BIOPSYCHOMETRIC ASSESSMENT	\$ 0.6M	\$ 0.6M
PE: 62234N	SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Project is to monitor human performance associated with critical jobs, with improved prediction of performance decrement.

Such performance decrements may not be recognizable through traditional performance assessment means, over short time periods, such as minutes. Monitoring will be online, in real time, and be unobtrusive. The operational tasks and systems are characterized by information system displays and panels and the information overload and underload associated with those systems.

Biopsychometric assessment refers to physiological measures of personnel with primary emphasis on neuroelectric measures of brain activity.

The accelerated worldwide development of technology makes it mandatory that the Navy keep abreast of developments that may pose unexpected threats or provide unanticipated opportunities. One such threat is posed by the proliferation of complex ship- and air-borne weapons systems. Evidence indicates that performance of combat-related cognitive tasks, such as detection and tracking by combat system operators (e.g., radar operators, sonar operators, aviators and air traffic controllers), may be variable in quality and often below predicted levels of performance.

In FY89/90, it is planned that work will be directed at methodological and basic research issues, and each lab will: (a) bring hardware and software into agreement with project standards, (b) perform a calibration experiment, (c) perform methodological research, and (d) begin work on ERP-performance (event-related potential) relationships in laboratory experiments.

The research plans for this project are organized to reflect the unique capabilities, interests, and experience of the participating laboratories. Work will be performed by the Navy Personnel Research and Development Center, the Naval Health Research Center and the Naval Aerospace Medical Research Laboratory.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved assessment of the combat readiness of system operators, and (b) enhanced system operators' performance in real time.

In FY88 specific accomplishments included: (a) examination of the fundamental relationship between decision-making under varying workload conditions and probe-ERPs (event-related potential), (b) examination of personality and cognitive characteristics of sonar operators, and (c) exploration of bimodal (simultaneous presentation of visual and auditory stimuli) information processing.

## PROGRAM ELEMENT OVERVIEW

PE: 63701N                      HUMAN FACTORS ENGINEERING DEVELOPMENT  
CONGRESSIONAL CATEGORY:      HUMAN FACTORS  
DoD ORGANIZATION:            NAVY  
  
FUNDING:                      FY89 \$ 2.5M (FY90 PRESIDENT'S BUDGET)  
                                FY90 \$ 2.5M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objectives of this Program Element are to: (a) improve crew and workstation design and evaluation methods to reduce errors and increase effectiveness of operation, (b) establish target acquisition and weapon system standards for displays people can understand, (c) develop airborne tactical decision aids for fleet air defense, anti-submarine warfare (ASW), and strike missions, (d) provide initial human factors support for new systems, and (e) improve the integration between ships and their crews.

This program also develops and evaluates new techniques for system design and seeks to improve fleet readiness through human factors technology.

Navy ships, aircraft, weapons, sensors, and command and control systems must be maintained and operated by Navy personnel. This program promotes a better fit among the operator, the equipment, and the mission so that hardware systems will operate with fewer human-induced errors and with greater safety and maintainability.

The in-house organizations responsible for this program are Naval Air Development Center, Warminster, PA.; Naval Weapons Center, China Lake, CA; Naval Air Test Center, Patuxent River, MD; and Naval Ocean Systems Center, San Diego, CA.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include assurance of a good fit among the operator, the equipment, and the mission in Navy systems. As a result, hardware systems operate more rapidly with fewer human-induced errors and with greater safety and maintainability. The development of these new human factors engineering technologies and their incorporation into the design of Navy systems will result in improved fleet performance.

## FUTURE DIRECTIONS:

Beyond FY90, plans for the Air Human Factors Engineering Technology Project include: (a) beginning flight tests of air combat optimum launch displays, and (b) completing the demonstration module of the ASW realtime decision aid.

Beyond FY90, plans for the Ship Human Factors Engineering Development Project include: (a) completing the interactive workstation for submarine approach officer, and (b) starting development of operability enhancements in software form for sonar mode and control selection, weapon presets, and engagement preview.

## PROJECT OVERVIEW

		89	90
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PROJECT: R1771	SHIP HUMAN FACTORS	\$ 1.6M	\$ 1.7M
	ENGINEERING DEVELOPMENT		
PE: 63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL OCEAN SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objective of this Project, which responds to recommendations by the Government Accounting Office (GAO), the Defense Science Board, and the Naval Research Advisory Committee, is to improve shipboard performance by incorporating human factors engineering during weapon system acquisition. Thrusts include: (a) tactical information management and decision-making, (b) battle force information management, (c) multisensor integration and data display, (d) combat system design, and (e) electronic display of maintenance data.

In FY89, plans include: (a) developing display formats and specifications for combat system console, (b) identifying formats that improve performance, (c) loading ASW data into the warfare database, and (d) using submarine display and simulation facility to identify optimal display formats.

In FY90, plans include: (a) testing displays for submarine approach officers, (b) completing ASW phase of warfare system performance database, and (c) assessing commonality of combat system operator tasks across warfare areas.

## PAYOFF/UTILIZATION:

The payoffs of this Project are solutions to man-machine interface problems (especially related to operator error and overload) in the increasingly sophisticated ship systems being built by the Navy, through increased and more effective use of human factors engineering techniques in weapon system acquisition.

In FY88, specific accomplishments included: (a) developed specifications for combat system general-purpose console, (b) evaluated data combat displays for submarine tactical approach officer, (c) fielded a classified prototype database that integrates data across mission areas, and (d) integrated data on Required Operational Functions (ROF), command and systems functions, and networks of warfare systems.

## PROJECT OVERVIEW

		89	90
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PROJECT: W0542	AIR HUMAN FACTORS	\$ 0.9M	\$ 0.9M
	ENGINEERING TECHNOLOGY		
PE: 63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL AIR DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Project is to improve combat effectiveness of Naval aviation systems by developing operator decision aids for increasingly complex air missions, and by providing improved aviation design methodologies that allow earlier, affordable identification of program design changes needed to enhance operator effectiveness.

In FY89, plans include to: (a) begin field test of Airborne Early Warning (AEW) real time decision aid/initiate ASW real time project, (b) employ rapid prototyping tool in new aircraft development/evaluation, and (c) develop prototype air combat optimum-launch displays.

In FY90, plans include to: (a) complete field test of real time decision aid, (b) transition AEW specifications to E-2C program, (c) work on ASW real time project, and (d) develop air combat optimum-launch displays.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improved aircrew performance in Naval aircraft systems for air combat and airborne command, control and communications. Improved performance will be accomplished by applying human factors engineering methods in the design and modification of airborne systems.

In FY88, specific accomplishments included: (a) development of real time decision aid for Airborne Early Warning (AEW) aircraft crews, (b) development of interactive prototype AEW aid, (c) further development of rapid-prototype tool for use with dynamic/interactive display evaluations, and (d) initiation of air combat optimum launch display development.

## PROGRAM ELEMENT OVERVIEW

PE: 63707N	MANPOWER AND PERSONNEL SYSTEMS
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL
DoD ORGANIZATION:	NAVY
FUNDING:	FY89 \$ 4.0M (FY90 PRESIDENT'S BUDGET) FY90 \$ 4.1M (FY90 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to address the need to produce required levels of personnel readiness, without increasing the cost of manpower, by exploiting emergent technologies. Computer-based measurement techniques will be used to verify job classification measures in terms of performance on-the-job (vice training performance).

Recent advances in mathematical optimization, computer technology, and advanced measurement techniques permit significant improvements in the utilization of personnel resources. The application of computer technology and advanced mathematical programming codes to personnel assignment will enable the Navy to maximize job fill, fleet needs, and individual preferences without increasing the cost of rotating personnel. New forecasting methods will greatly improve the use of personnel resources (e.g., the PCS budget) that directly affect personnel readiness.

This effort responds to a Congressional mandate and DoD-wide joint-Service effort to establish and relate enlistment selection criteria to successful job performance.

While related in objective and approach to the research and development of the other Services, this Program Element is unique in that it is tailored to the organization and people of the Navy. To ensure that unnecessary duplication of work does not arise, extensive preliminary literature reviews are conducted, and liaison is maintained with the Office of the Under Secretary of Defense for Research and Engineering, and with the Army and Air Force through program reviews, information exchanges, visits, and special briefings.

The in-house developing organization responsible for this program is the Navy Personnel Research and Development Center, San Diego, CA.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include improved accession and utilization of people resources through better classification, skill level assignments, productivity, and retention.

Specific payoffs include: (a) improved forecasts of manpower requirements, (b) better job performance measures, leading to enhanced recruitment and classification standards for accession of higher quality enlistees, (c) more accurate assignment of personnel, (d) better management of the Navy's enlisted and officer personnel, and (e) more timely and appropriate understanding and meeting of concerns of military and civilian personnel, and thus, improved performance and retention.

FUTURE DIRECTIONS:

Beyond FY90, plans for the Manpower and Personnel Systems Project include: (a) expanding testing of performance measurements to all enlisted job families, and (b) testing the PCS expenditure control system.

## PROJECT OVERVIEW

		89	90
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PROJECT: R1770	MANPOWER AND PERSONNEL SYSTEMS	\$ 4.0M	\$ 4.1M
PE: 63707N	MANPOWER AND PERSONNEL SYSTEMS		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

## PROJECT SYNOPSIS:

The objective of this Project is to demonstrate the feasibility of using advances in computer technology, mathematical optimization, and measurement theory for: (a) making selection tests relevant to Navy jobs rather than Navy school performance, (b) optimizing the personnel assignment process to improve readiness and satisfaction of Navy needs and individual preferences without increases in the cost of rotating personnel, and (c) introducing better methods of force planning so that short-term readiness is not achieved at the expense of future personnel shortages and accelerated budgets.

This Project is divided into four major thrust areas: (a) Selection and Classification responds to a Congressional mandate and DoD-wide, joint-Service effort to relate enlistment selection criteria to successful job performance. (b) Personnel Assignment develops systems for optimal person-job matches based on cost, operational needs, and individual preferences using recent advances in mathematical optimization techniques. (c) Force Management determines how computer technologies and operations research techniques can improve personnel force planning and policy evaluation, with focus on the development of information delivery systems that allow force managers to rapidly and accurately evaluate alternative personnel plans to avoid cost errors and major readiness deficiencies, and (d) Career Development determines the sequence and type of jobs for military personnel careers that will maximize productivity and retention.

In FY89, plans include: (a) testing optimal assignment procedures for minimizing enroute training, (b) testing improved techniques for forecasting PCS moves, and (c) validating enlisted selection standards for electronic/electrical jobs.

In FY89, plans include: (a) conducting implementation test of PCS forecasting system, and (b) evaluating optimal assignment system for 90 percent of the enlisted force.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved manpower utilization (i.e., requirements, recruitment and classification standards, assignment of personnel, management of personnel inventory, and increased retention and satisfaction of civilian and military personnel).

In FY88, accomplishments included: (a) validation of enlisted selection standards for communications jobs, (b) testing of optimal assignment procedures for 38 ratings, and (c) development of officer PCS move forecasting methods.



## PROGRAM ELEMENT OVERVIEW

PE: 63720N                      EDUCATION AND TRAINING  
CONGRESSIONAL CATEGORY:      EDUCATION & TRAINING  
DoD ORGANIZATION:            NAVY  
  
FUNDING:                      FY89 \$ 6.2M (FY90 PRESIDENT'S BUDGET)  
                                 FY90 \$ 6.4M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to respond directly to Congressional guidance and Department of Defense (DoD) directives to exploit emerging technologies to make Navy training more efficient and effective.

Project R1772 focuses on: (a) developing automated systems, (b) demonstrating artificial intelligence, expert systems, job performance training aids, automated performance testing, and advanced training and evaluation technologies, (c) utilizing automation and expert systems for the development, revision, updating, delivery, and management of Navy training.

The in-house developing organization responsible for this program is the Navy Personnel Research and Development Center, San Diego, CA.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include cost containment and increased personnel combat readiness through the application of technology advances that increase the effectiveness of individual, team, Naval Reserve, maintenance, operator, and on-the-job training.

The effort will improve instruction by applying artificial intelligence and expert systems, some of which learn by monitoring performance (i.e., the system learns, expands its intelligence and expertise, and becomes a more effective teaching mechanism). Computer technology is combined with operations research methods to allow the Navy to manage training resources better, including major changes in the way training pipelines are managed over entire Navy careers.

## FUTURE DIRECTIONS:

Beyond FY90, plans for the Education and Training Project include: (a) applying artificial intelligence to logistics training materials development, (b) applying new technologies to performance testing, tying training more closely to new job requirements, and (c) implementing forecasting tools for training resource management.

## PROJECT OVERVIEW

		89	90
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PROJECT: R1772	EDUCATION AND TRAINING	\$ 6.2M	\$ 6.4M
PE: 63720N	EDUCATION AND TRAINING		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Project is to determine and experimentally demonstrate in close coordination with intended Navy users (such as officer and enlisted schools, on-the-job trainers, and training policy makers) the feasibility of advances in artificial intelligence, cognitive science, computer and training technologies.

This Project includes four training technology areas: (a) Innovative Training Technology Applications determines to what extent advances in artificial intelligence (AI) and instructional, cognitive, and computer technologies can improve the instructional development and delivery processes. The focus is on development of authoring systems that will give subject matter experts the capability of designing, updating and producing standardized instructional materials of high quality tied directly to job performance requirements, (b) Artificial Intelligence Training (AIT) Initiatives provides concept demonstrations of a range of artificial intelligence technologies in Navy training environments. The focus of this effort is on complex, dynamic delivery systems using interactive, simulation-based instruction. Some such systems are capable of learning by monitoring expert performance. Ship propulsion engineering is used as a technology demonstration context, (c) Training Evaluation Technology develops automated aids, software tools, and general procedures for developers of computer-based operator and maintenance performance tests, and (d) Training Management Technology addresses issues involving both aggregate resource management and individual career training for both enlisted and officer training, shore-based and on-the-job.

In FY89, plans include: (a) developing a training curriculum and delivery technology to address the skill deficiencies of the future recruit population, (b) field testing of the surface and subsurface warfare battle management simulation trainer and maintenance trainer/performance evaluator, and (c) developing an advanced automated instructional system.

In FY90, plans include: (a) extending the training materials development system to logistics information, (b) implementing advanced microcomputer training systems at fleet and reserve sites, and (c) testing techniques to counter low-entry skills.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) an automated training system adaptable to the changing nature of Navy jobs, (b) an improved training quality in the classroom, on-the-job, and for the Reserves, and (c) a simplified and standardized instructional development process.

In FY88, specific accomplishments included: (a) field testing a computer training system for intelligence officers and a troubleshooting maintenance trainer and performance evaluator, (b) field testing an expert training materials development system and battle simulation trainer/performance evaluator, and (c) beginning Navy and USMC operational tests of an

instructorless drill-and-practice computer-based system for threat analysis training.

## PROGRAM ELEMENT OVERVIEW

PE: 63732M                      ADVANCED MANPOWER/TRAINING SYSTEMS  
CONGRESSIONAL CATEGORY:      EDUCATION & TRAINING  
                                 MANPOWER & PERSONNEL  
                                 SIMULATION & TRAINING DEVICES  
DoD ORGANIZATION:            MC  
  
FUNDING:                      FY89 \$ 3.1M (FY90 PRESIDENT'S BUDGET)  
                                 FY90 \$ 4.1M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to provide the RDT&E funds for the advanced development of systems and equipment to improve the manpower and training readiness of the Fleet Marine Force and to develop techniques and methods that advance the use and control of human resources in the Marine Corps.

This objective will be met by work in the following areas: (a) human resources management and forecasting, (b) training devices and simulators, (c) Marine Corps training resources development and analysis, and (d) Marine Corps professional military education.

The in-house developing organization responsible for this program is the Navy Personnel Research and Development Center, San Diego, CA.

## PAYOFF/UTILIZATION:

The payoff of the Program Element will be enhanced Fleet Marine Force readiness due to improved manpower training, planning, and control.

Work under this Program Element will result in: (a) techniques and methods that advance the use and control of human resources in the Marine Corps, (b) development of training devices and simulators not developed in conjunction with a major end item, (c) methods and techniques to improve the effectiveness of training conducted throughout the Marine Corps, and (d) software enhancements to the instructional management system.

## FUTURE DIRECTIONS:

Beyond FY90, plans for the Human Resources Management/Forecasting Project include: (a) implementing the selective reenlistment and enlistment bonus models, (b) developing alternative corrective strategies for JHRS, (c) formulating modernization proposals and estimating requirements for PREPAS II, and (d) completing the Reserve Program Module and Qualified Military Available for the Automated Recruit Management System.

## PROJECT OVERVIEW

		89	90
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PROJECT: C0073	HUMAN RESOURCES MANAGEMENT AND FORECASTING	\$ 3.1M	\$ 4.1M
PE: 63732M	ADVANCED MANPOWER/TRAINING SYSTEMS		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	MC		
RESPONSIBLE ORGANIZATION:	HEADQUARTERS, USMC		

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PROJECT SYNOPSIS:

The objective of this Project is to develop systems and equipment to improve the manpower readiness of the Fleet Marine Force, and develop techniques and methods which advance the use and control of human resources in the Marine Corps.

This joint-Service Project will replace the Armed Services Vocational Aptitude Battery as the mental qualifier for Service selection and classification.

In FY89, plans include: (a) completing the Officer Assignment Decision Support System (OADSS), and (b) beginning the new phase of Joint Job Performance Measurement (JJPM).

In FY90, plans include: (a) initiating two new programs, Joint Human Resource Studies (JHRS) to identify system vulnerability, and PREPAS II to plan for incorporation of new technologies into manpower systems, and (b) conducting JJPM field testing.

## PAYOFF/UTILIZATION:

The payoffs of this Project include advanced system development for human resources management and forecasting to improve Marine manpower readiness.

In FY88, specific accomplishments included: (a) completion of test development, and (b) completion of data collection for Joint Job Performance Measurement (JJPM) of the infantry MOS (General Technical composite).

## PROGRAM ELEMENT OVERVIEW

PE: 63733N                      SIMULATION AND TRAINING DEVICE TECHNOLOGY  
CONGRESSIONAL CATEGORY:      SIMULATION & TRAINING DEVICES  
DoD ORGANIZATION:            NAVY  
  
FUNDING:                      FY89 \$ 6.5M (FY90 PRESIDENT'S BUDGET)  
                                FY90 \$ 6.7M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to develop and demonstrate new capabilities in training technology and equipment.

The principal focus of this effort is on proof-of-concept, reduction of risk, and cost effectiveness in training device acquisition. Current technical areas include advanced simulation of visual and sensor systems, part-task/low-cost training alternatives and expert systems. This Project provides the main developmental links between exploratory development work in simulation, training device and human factors technologies, and first-article procurement in aviation, surface, and subsurface systems. It targets training deficiencies identified in Warfare Area Assessments, Fleet research and Development Objectives, Operational Requirements, and Fleet endorsements.

In FY84, Projects previously included in this Program Element were consolidated into a single Project (W1773) with six Subproject product areas to allow flexibility in structuring technology development to satisfy acquisition program needs. Subproject 62257N, Training Devices and Simulation, provides the principal technology base. Work is coordinated through a series of working groups, with: 62727A, Non-systems Training Devices Technology, 62205F, Training and Simulator Technology, 63216A, Synthetic Flight Simulator Development, 63227F, Advanced Simulator Technology, and Marine Corps Elements 63732M and 64657M. Work directly supports 64703N, Personnel Training, Simulation and Human Factors, 64714N, Air Warfare Training Devices, and 64715N, Surface Warfare Training Devices. The success achieved from advanced development applications leads to prototype implementations, or to first-article procurement, and to device acquisition.

The in-house developing organization responsible for this program is the Naval Training Systems Center, Orlando, FL.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include new capabilities in simulation training technology and equipment, with principal focus on proof-of-concept, reduction of risk, and cost effectiveness in training device acquisition. It is estimated that millions of dollars could be saved as a result of the work done under this Program Element.

## FUTURE DIRECTIONS:

Beyond FY90, plans for the Simulation and Training Devices Project include: (a) completing multispectral radar simulation development for various trainer applications, (b) testing and validating night attack sensor simulations, (c) completing development of battle force systems integration test and training systems for proof-of-concept validation of embedded training subsystems in operational combat systems, and (d) delivering procurement specifications for improved rotor wing flight models, and surface and air sensor simulations.

## PROJECT OVERVIEW

		89	90
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PROJECT: W1773	SIMULATION AND TRAINING DEVICES	\$ 6.5M	\$ 6.7M
PE: 63733N	SIMULATION AND TRAINING DEVICE TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objective of this multi-platform, technology demonstration effort is to demonstrate the potential of new technological advances for increasing operational effectiveness without involving major subsystem hardware development. It is the principal link between exploratory development in simulation, training device and human factors technologies, and first-article training device procurement in aviation, surface and subsurface systems.

The effort addresses needs in all warfare areas, targeting training deficiencies identified in Warfare Area Assessments, Fleet R&D Objectives, Operational Requirements, and Fleet endorsements. The threat being addressed is the potential inability to meet the enemy's warfighting capability if our force is inadequately trained. This Project interfaces with all weapon system trainers that are to be operational in 1987-1991, and thus the products must be available for integration by this 1987-1991 time frame. Specific components to be developed under this study include (a) visual and sensor simulation, (b) improved software techniques for simulation, (c) instructional systems methods, and (d) part-task trainer designs and artificial intelligence-based trainer designs. Technical areas include visual, motion, sensor, weapons fire, and maintenance simulation. A special characteristic of this Project is that it is the Navy's entire 6.3 effort in simulation and training devices. The Army and Air Force, as well as the Naval Sea Systems Command, support and track this multi-platform effort.

In FY89, plans include: (a) completing development of functional specifications for a deployable Hands-on Throttle and Stick Trainer for the F/A18, (b) completing system development of Radar Systems Integrated Test and Training, (c) beginning integration/installation for combat systems integration testing and training at battle force level, and (d) beginning a night attack simulation development effort for All-Weather Night Attack tactical aircraft trainers.

In FY90, plans include: (a) developing battle force test and training system, (b) developing specifications for helicopter rotor dynamics simulation, (c) transitioning helicopter rotor dynamics specifications to procurement agencies, and (d) beginning developing performance measurement systems for strike warfare and embedded Anti-Submarine Warfare (ASW) training for airborne platforms.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improvements in: (a) visual, motion, sensor, weapons fire, and maintenance simulation components and capabilities, (b) software techniques for simulation, and (c) instructional-systems methods, part-task trainer designs, and trainer designs based on artificial intelligence. Major improvements in capability to be achieved are reduced trainer acquisition risk, decreased simulation design costs, 40-60 percent reduction in life-cycle cost, and 10 percent reduction in operational system

utilization costs.

In FY88, specific accomplishments included: (a) completion of design guidelines for the helmet-mounted display for the F/A18 training system, (b) completion of performance and specifications for battle combat systems integration test and training systems computer program test plan, (c) completion of computer program test plan for the embedded intelligent training support system, and (d) initiation of development of a flight simulation for engagement training.



## PROGRAM ELEMENT OVERVIEW

PE: 63739N                      NAVY LOGISTICS PRODUCTIVITY  
 CONGRESSIONAL CATEGORY:      HUMAN FACTORS  
 DoD ORGANIZATION:            NAVY  
 FUNDING:                      FY89 \$ 1.5M (FY90 PRESIDENT'S BUDGET)  
                                  FY90 \$ 1.5M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this Program Element is to improve the quality and productivity of Navy industrial activities such as shipyards, Naval Aviation Depots, and other shore-based maintenance activities, through designing, implementing, and evaluating a wide range of industrial management techniques employed by successful private-sector manufacturing companies or developed in private and government laboratories. This program will satisfy a congressional mandate for a feasibility study concerning the establishment of technology transfer centers to support Navy logistics productivity improvements and will examine the concept of joint-Industry/Academia/Government participation to investigate problems and determine technology solutions.

Techniques considered in this effort include: (a) process-oriented quality control, (b) enriching and redesigning jobs, (c) maximizing utilization of new technology, (d) improving organization and individual measurement systems, (e) revising organization structures that promote communication and participation among all levels, and (f) developing improved information management and decision support systems.

Some of the characteristics typical of Navy repair/overhaul organizations include a hybrid military-civilian management structure, outdated facilities and technology, lack of acceptable performance measurement systems, a repair/overhaul mission driven by Fleet operational needs, a highly structured and multi-layered organization structure, and a reward system that emphasizes caution over risk-taking. The process of implementing the various productivity improvement techniques will be based on a research-generated model of introducing and sustaining beneficial change in organizations.

Each Project in this Program will address different combinations of productivity-enhancing and will build successively on knowledge gained in previous demonstrations. This synergistic approach to Project integration will result in efficient use of Program funds and participating organization resources. Policies, procedures, and practices will be changed to facilitate full implementation across all Navy shipyards, air rework facilities, and intermediate maintenance activities.

The in-house developing organizations responsible for this program are the Navy Personnel Research and Development Center, San Diego, CA, and the Naval Supply Systems Command, Washington, DC.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include improved quality and productivity of Navy maintenance and logistics systems, which will lead to lower costs and higher reliability and availability of Fleet weapon systems. This, in turn means improved Fleet readiness and sustainability.

FUTURE DIRECTIONS:

Beyond FY90, plans for the Quality Improvement project include: (a) monitoring expansion to other sites and evaluate results and (b) adjusting procedures and guidelines where necessary.

Beyond FY90, plans for the New Technology project include the initiation process for establishing and maintaining technology transfer centers.

## PROJECT OVERVIEW

		89	90
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PROJECT: T1885	QUALITY IMPROVEMENT	\$ 1.0M	\$ 1.2M
PE: 63739N	NAVY LOGISTICS PRODUCTIVITY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

## PROJECT SYNOPSIS:

The objective of this Project is to design, develop, test, and evaluate new management and process control techniques for improving the quality and productivity at Navy maintenance and repair activities.

The effort includes: (a) examining of the organizational, psychological and technical factors associated with new management and statistical process control techniques in a Navy maintenance and support environment, (b) determining the most effective combination of organization, technical and human resource factors contributing to successful implementation of new techniques, and (c) transferring lessons learned to other maintenance and repair activities.

Quality control techniques have been successfully adopted in private-sector manufacturing organizations and in foreign countries, most notably Japan. Many U.S. organizations have been unsuccessful in their attempts to implement and sustain them. Although these failed attempts have often been attributed to cultural differences between U.S. and Japanese firms, this does not account for the successful implementations. A greater understanding of the factors underlying success and failure is needed in order to make wide-scale Navy application of these techniques possible.

This project will examine the organizational, psychological and technical factors responsible for facilitating or inhibiting the full utilization of these techniques in a Navy maintenance and support environment. Initial emphasis will be on tailoring and introducing the quality management technique known as statistical process control which was successfully introduced in Japan after World War II by W. Edward Deming and is largely responsible for that country's present world leadership in quality and productivity growth.

The first phase of the Project is directed at improving the quality of aircraft engine overhauls in a Naval Air Rework Facility (NARF). Organization structures, policies, and responsibilities will be modified to tailor the technique to the NARF. Jobs of overhaul mechanics will be redesigned using the mechanics themselves as the principle source of information for the redesign effort. Criteria and measures of key quality variables will be identified and incorporated in a new decision support system which will be used to monitor process quality. An evaluation will be conducted to determine the most effective combination of organization, technical and human resource factors contributing to successful implementation of the new process control technique. Information resulting from this evaluation will be used to facilitate the transfer of the techniques to other product lines and functions at the demonstration site. Lessons learned about the process of introducing and sustaining these techniques will be applied to other NARFs.

In FY89 plans include: (a) expanding the application of statistical process control throughout the test site, (b) developing a process-oriented quality audit plan, (c) collecting data and providing development analysis, (d) reporting on progress, and (e) implementing approach based on

interim evaluation, and (e) applying and evaluating new techniques at test sites.

In FY90, plans include: (a) conducting an activity-wide quality audit at the demonstration site, (b) evaluating progress in implementing total quality management at the demonstration site, and (c) continuing the application and evaluation of new techniques at selected sites.

PAYOFF/UTILIZATION:

The payoffs of this Project are new process control techniques applied to Navy maintenance activities, which will lead to increased quality and productivity of the repair and overhaul of Navy ships and aircraft. This will offer increased product quality at much lower cost.

In FY88, specific accomplishments included: (a) developing evaluation criteria and a measurement system for new management and statistical process control techniques, and (b) developing guidelines for implementing new quality and productivity improvements.

## PROJECT OVERVIEW

		89	90
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PROJECT: T1886	NEW TECHNOLOGY	\$ 0.5M	\$ 0.3M
PE: 63739N	NAVY LOGISTICS PRODUCTIVITY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Project is to improve the process of identifying, applying, and evaluating new technology in Navy shore support activities.

This will be accomplished by: (a) developing and evaluating technology transfer and evaluation models, (b) identifying and testing organizational, human resource and technological factors contributing to effective implementation and utilization, and (c) developing guidelines to identify emerging technologies, matching them to problems, and implementing and using the technologies effectively in operational settings.

A recent Congressional study concluded that technology utilization is less than 30 percent of capacity. This Project, was accelerated to begin in FY86, instead of FY87, and is in response to a Congressional request to conduct a three-year feasibility study of a concept to identify and apply state-of-the-art technology to critical repair, maintenance, and acquisition problems in DoD support functions.

In FY89, plans include: (a) introducing the Tehnology Transfer Center concept in both industry and government workplaces, (b) initiating the technology transfer plan, (c) identifying technology transfer project evaluation criteria and measures, (d) selecting and preparing demonstration site(s), (e) collecting baseline data, and (f) developing a full-scale operational utilization model for implementation.

In FY90, plans include: (a) verifying concepts, models, and techniques, (b) establishing the new technology transfer project, (c) extending Combined Laser Inspection and Processing (CLIP) probe application to compressor and turbine blade inspection and repair, and (d) developing guidelines for DoD-wide application of emerging productivity-enhancing technology.

## PAYOFF/UTILIZATION:

The payoff of this Project is more effective application of new technologies in Navy shore support activities, and thus increased productivity.

In FY88, specific accomplishments included: (a) evaluation of a university-based technology transfer center concept, (b) demonstration of CLIP (Combined Laser Inspection and Processing) Probe technology development, (c) evaluation of technological solutions, and (d) development of a university-based Technology Transfer Center (TTC) plan.

## PROGRAM ELEMENT OVERVIEW

PE: 64703N PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL

DoD ORGANIZATION: NAVY

FUNDING: FY89 \$ 1.0M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 1.0M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this Program Element is to develop systems that are both innovative and cost-effective to help ensure Fleet readiness.

This Program applies advanced technologies to operational requirements in manpower, personnel, training, and human factors. It focuses on adaptive testing, mathematical optimization, manpower forecasting, computer-based simulation, and decision support systems.

Computer-based manpower and personnel systems ensure Navy combat readiness by raising the overall quality of manpower accessed into the Navy and assigned to the Fleet. The Computerized Adaptive Testing system for the Armed Services Vocational Aptitude Battery (CAT-ASVAB) will be much more cost-effective than the existing paper-and-pencil methods. A simulation of personnel inventory flows is required to analyze and adjust enlisted rotation patterns to maintain Fleet readiness by optimizing short-term savings in Permanent Change of Station costs versus long-term savings in retention costs.

The work is performed by the Navy Personnel Research and Development Center.

## RELATED ACTIVITIES:

Program Elements 0602722A, Personnel and Training; 0602233N, Mission Support Technology (Personnel and Training Technology); 0602703F, Personnel Utilization Technology; 0603731A, Manpower and Personnel; 0603707N, Manpower and Personnel Systems; 0603732M, Marine Corps Advanced Manpower Training Systems; and 0602704F, Manpower and Personnel Systems Technology. Joint-Service CAT-ASVAB Working Group - Navy is lead Service.

## PAYOFF/UTILIZATION:

The payoff of this Program Element is improvement in the overall quality of manpower processed into the Navy and assigned to the Fleet.

The Computerized Adaptive Testing system for the Armed Services Vocational Aptitude Battery (CAT-ASVAB) will reduce administration time at Military Entrance Processing Stations, improve scoring accuracy, provide better security, and lend itself to quick, accurate, standardized revisions. This test-administration system will be far more cost-effective than the existing paper-and-pencil methods.

## FUTURE DIRECTIONS:

In FY91, it is planned to (a) analyze CAT-ASVAB score equating verification data, and (b) test and evaluate the full-scale rotation management model.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: R1822	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS	\$ 1.0M	\$ 1.0M
PE: 64703N	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

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PROJECT SYNOPSIS:

The objective of this Project is to develop and evaluate systems to enhance the Navy's capabilities in recruitment, selection, assignment, attrition, retention, and personnel utilization.

When instructional technologies successfully complete advanced development (6.3), they are prepared for generalized and standardized use throughout the Navy. This Project responds to Congressional and DoD requirements to increase training efficiency and effectiveness through the use of technology, and to improve training software transportability.

In FY89, it is planned to: (a) develop Computerized Adaptive Test (CAT) equating procedures, and (b) test prototype rotation models for sample ratings.

In FY90, it is planned to: (a) verify score equating for CAT-ASVAB, and (b) develop a full-scale sea/shore rotation management model.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved combat readiness by raising the overall quality of manpower assigned to the Fleet.

In FY88, specific accomplishments included: (a) analyzing the impact of computerizing the Armed Services Vocational Aptitude Battery, and (b) developing a prototype rotation model.

## PROGRAM ELEMENT OVERVIEW

PE: 64715N SURFACE WARFARE TRAINING  
CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES  
DoD ORGANIZATION: NAVY  
FUNDING: FY89 \$ 18.8M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 17.7M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to support the Chief of Naval Operations Surface Warfare Sponsor mission by improving readiness and training.

This Program Element was developed to satisfy the requirements of the Fleet and the Chief of Naval Education and Training, for development of prototype surface warfare training devices to provide improved training, thereby improving operational readiness, efficiency, and safety while decreasing training time and cost. Specifically, this Program Element supports the development of prototype surface warfare training devices which are not developed as part of a parent weapon system development process or not characterized by emerging training device technology (and therefore included within Program Element 64703N, Training Device Prototype Development).

Program Element 64715N has four general areas of effort: (a) operator/team trainers in the area of electronic/acoustic surveillance in ASW (Anti-Submarine Warfare) operations for existing or planned operational equipment, (b) maintenance trainers for various electronic/acoustic devices and trainers in the operation of engine room equipment for existing and new development engineering equipment, (c) modification, update, consolidation, or replacement of existing training devices, and (d) other training problem areas which can benefit by the use of stimulation/simulation training device techniques.

The in-house work is performed by the Naval Training Systems Center.

## RELATED ACTIVITIES:

Not applicable.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) improved training, (b) reduced training costs, (c) safer training conditions, and (d) enhanced operational readiness.

The high cost of operational training exercises at sea continues to make it imperative to develop, improve, and make extensive use of alternative shipboard methods for individual and team training. Although they are complex and continuously evolving, these training systems will provide realistic training at a fraction of the cost of the same training at sea. They also expose the trainees to a broad range of scenarios that could not be carried out in live situations. The end product is an enhancement of operational readiness.

## FUTURE DIRECTIONS:

In FY91, for the Surface Tactical Team Trainer Project, it is planned to: (a) continue 20A66 (an Anti-Submarine Warfare Tactical Team Trainer) Lot I



development with emphasis on software development and initial hardware interfacing, and (b) complete Device 20A66 Critical Design Review in early 1991.

In FY91, for the Landing Craft Air Cushion (LCAC) Operator Trainer Project, it is planned to: (a) conduct a test and evaluation and trainer acceptance, and (b) complete the program.

## PROJECT OVERVIEW

	89	90
	----	----
PROJECT: S1126	SURFACE TOMAHAWK TRAINER \$ 0.0M	\$ 0.0M
PE: 64715N	SURFACE WARFARE TRAINING	
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES	
DoD ORGANIZATION:	NAVY	
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER	

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PROJECT SYNOPSIS:

The objective of this Project is to design, develop, fabricate and install TOMAHAWK surface missile operator/subteam trainers.

The device will train personnel in the total over-the-horizon combat (defense/offense) operations of this weapon system. Four suites of the device will provide operator training starting with simple "knobology" and progressing through TOMAHAWK Weapons Control System subteam training. The operator consoles will consist of actual GFE-Operator Interactive Display Terminal (OIDT) consoles which provide the same controls and indicators for data entry, information display, system monitoring, and control of the OIDT as provided in the operational weapons system. Program functions and hardware reactions not present will be simulated in a simulation computer. Additionally, outside inputs such as satellite communication, OUTBOARD, ships navigation system, and Link 11 inputs will be provided or simulated.

This project is not funded beyond FY89.

## PAYOFF/UTILIZATION:

The payoffs of this Project include enhancement of the Navy's ability to train for battle, specifically, the ability to utilize the TOMAHAWK cruise missile in the anti-ship mode in both battle group and battle force operations.

## PROJECT OVERVIEW

	89	90
	----	----
PROJECT: S1140	TACTICAL ADVANCED COMBAT \$ 2.5M	\$ 1.0M
	DIRECTION ELECTRONIC WARFARE (TACDEW) MODIFICATION	
PE: 64715N	SURFACE WARFARE TRAINING	
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES	
DoD ORGANIZATION:	NAVY	
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER	

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PROJECT SYNOPSIS:

The objective of this Project is to achieve a progressive redesign of the environment generation/control system and control systems of the Tactical Advanced Combat Direction and Electronic Warfare (TACDEW) device.

The TACDEW training complexes, located at Fleet Combat Training Centers Atlantic and Pacific, are a vital link in the training chain for integrated combat system team training. This training system will have a direct impact on the Navy's ability to train for battle, specifically, the Navy's capability for integrating combat systems and weapon system trainers in multi-threat/multi-team exercises for both battle group and battle force training, which will represent actual operational situations in any area of the world. During the operational life of these complexes, numerous add-on capabilities have been incorporated and frequent changes have been made to the Master Simulation Program to maintain currency with Fleet training requirements. This continued expansion of the complexes, coupled with obsolescence of the computer system originally installed in TACDEW, have negated the potential for further growth to accommodate training for emerging combat system capabilities identified through the Navy Training Plan process. The Project will include: (a) replacement of the obsolescent computer system with modern computational capabilities, (b) redesign of the Master Simulation Program, (c) substitution of the Generic Radar Display System subsystem to provide capabilities representative of modern radar equipment, and (d) incorporation of a state-of-the-art problem control and evaluation subsystem. The modified TACDEW system will support combat system operational training at all required levels, including individual operator, subteam, and combat system through the year 2000.

In FY89, it is planned to: (a) complete Phase II development, and (b) complete installation and delivery of the trainer (August 1989).

In FY90, it is planned to: (a) achieve initial operating capability (November 1989), and (b) complete the logistics support package.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improvement of the Navy's ability to train for battle, specifically, the Navy's capability for integrating combat systems and weapon system trainers in multi-threat/multi-team exercises for both battle group and battle force training which, will represent actual operational situations in any area of the world.

In FY88, specific accomplishments included: (a) coding, testing, and integrating the warfare functions software, and (b) procuring and integrating major items of hardware.

## PROJECT OVERVIEW

		89	90
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PROJECT: S1427	SURFACE TACTICAL TEAM TRAINER	\$11.2M	\$ 7.4M
PE: 64715N	SURFACE WARFARE TRAINING		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objective of this Project is to develop a generic training system which will replace obsolete/obsolescent devices to provide team procedural and tactical training/evaluation in a multi-threat environment for conventional and tactical data-equipped ships.

The first device to be developed, Device 14A12, Surface Anti-Submarine Warfare (ASW) Trainer, will replace the obsolete devices currently used to provide Anti-Submarine Warfare (ASW) team training. The 14A12 will have the capability to exercise the essential procedures of an ASW engagement and will simulate current and future emerging passive and active sensors operating in a common ocean model. A natural progression of Device 14A12, Device 20A66, ASW Tactical Team Trainer, is planned to replace the ASW Coordinated Tactics Trainers, Devices X14A6 and 14A6, built in the 1960s. The 20A66 trainer will provide multiple platform/multi-threat procedural, tactical, and decision-making training for single units up to battle group size. Each trainer will be composed of multiple ship, submarine, and aircraft "command centers" configured with multi-purpose equipment, which will simulate the sensor, weapon, and communication capabilities of the platforms represented.

In FY89, it is planned to: (a) complete testing, deliver and install contractor software/system (July 1989); device 14A12 completes R&D prototype, and (b) commence development of the 20A66.

In FY90, it is planned to continue development of 20A66 with procurement of preliminary Lot I hardware and software for FLEASWTRACENPAC, San Diego.

## PAYOFF/UTILIZATION:

The payoff of this Project includes improvement of the Navy's ability to train for battle; specifically, the 14A12 and 20A66 will provide greater capability for existing and emergent surface combatants to conduct multi-platform ASW operations against submarine threats, and also comply with the reduced OPTEMP0/Fuel constraints.

In FY88, specific accomplishments included: (a) continuing 14A12 development; procuring and integrating hardware, and (b) coding and conducting module tests, and integrating and conducting system tests.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: S1436	SURFACE WARFARE TRAINING ANALYSIS	\$ 1.5M	\$ 0.0M
PE: 64715N	SURFACE WARFARE TRAINING		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objectives of this Project are: (a) to conduct front-end analysis of specific training problems to include definition of requirements/shortfalls, training objectives, and student loading, and (b) to identify alternate solutions with related cost/training effectiveness trade-offs.

The HARDMAN study continues to develop training requirements for the Surface Warfare Community by analyzing and identifying present and future training needs, and manpower requirements for major system acquisitions. To respond to those requirements, individually tailored, detailed trainer/training systems selection procedures must be developed.

Instructional System Development (ISD) analysis methods are used to produce an appropriate functional specification for each trainer/training system. Some of these analyses are: (a) determination of specific training objectives, (b) determination of alternative solutions to the training needs/requirements, and (c) cost/training effectiveness studies. This effort extends beyond the HARDMAN program since functional specifications must be developed and tailored to individual training systems/devices before contracts are awarded. This front-end analysis effort includes those parts of the ISD methods used: (a) to tailor the device or system to specific training objectives, (b) to ensure inclusion of latest technology, and (c) to avoid "gold plating" by cost/training effectiveness trade-offs. Thus, the individual elements of the specific training system will most effectively reflect the requirements and needs identified by the HARDMAN program.

This Project is not funded beyond FY89.

## PAYOFF/UTILIZATION.

The payoffs of this Project include the identification of alternate solutions to specific training problems, with related cost/training effectiveness trade-offs, through conducting a front-end analysis of problems to include definition of requirements/shortfalls, training objectives, and student loading.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: S1834	LANDING CRAFT AIR CUSHION (LCAC) OPERATOR TRAINER	\$ 3.6M	\$ 9.3M
PE: 64715N	SURFACE WARFARE TRAINING		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

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PROJECT SYNOPSIS:

The objective of this Project is to provide an operator trainer for Landing Craft, Air Cushion (LCAC) vehicles.

The LCAC Full Mission Trainer, Device 1066, will provide LCAC crews (craftmaster, engineer, navigator, and group commander) training in the skills, procedures and techniques required to operate the LCAC. Training will include normal and emergency procedures and proficiency. This device will have direct impact upon the Navy's ability to train for battle; it affords more flexibility and more versatile training in preparing LCAC crews in all phases of craft operations and at a significant cost reduction over use of actual craft. Training exercises under instructor and computer software control will depict the operational characteristics of the LCAC, and will provide a dynamic environment within which to learn the skills and maintain proficiency to safely operate and control the LCAC.

In FY89, it is planned to: (a) continue development of Full Mission Trainer (FMT) computer programs, (b) complete trainer hardware fabrication, (c) conduct a critical design review, (d) achieve contractor acceptance of the motion and visual systems, (e) install motion and visual systems on the FTM, and (f) conduct hardware/software integration and testing.

In FY90, it is planned to: (a) complete software integration, and (b) install the system.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) development of a LCAC operation trainer that will provide LCAC crews (Craftmaster, Engineer, Navigator and Group Commander) training in the skills, procedures, and techniques required to operate the LCAC in its operational environment, and (b) enhanced ability of the Navy to train for battle, specifically, more flexible and versatile training in preparing LCAC crews in all phases of craft operations, and at a significant cost reduction (e.g., fuel, craft maintenance) over use of actual craft for training.

In FY88, specific accomplishments included: (a) completing the detailed hardware and software design, (b) procuring the main computer system, (c) continuing development of the visual simulation system, (d) procuring the motion simulation system, and (e) fabricating the student station, including simulated LCAC.

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04206	ONR	6.324	7.741	ET	6	PERSONNEL AND TRAINING
RR04208	ONR	2.759	3.378	MP	3	GROUP PSYCHOLOGY
RR04209	ONR	2.415	2.959	HF	4	ENGINEERING PSYCHOLOGY
		11.498	14.079			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	11.498	14.075

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CF31P14	NPRDC	0.455	0.525	1P	2	MARINE CORPS MANPOWER & TRAINING TECHNOLOGY
		0.456	0.525			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62131M :						
THE PRESIDENT'S BUDGET, JANUARY 1989		0.455	0.525			

(CONTINUED)



(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33M20	NPRDC	2.640	2.738	MP	2	MANPOWER AND PERSONNEL TECHNOLOGY
RM33T21	NTSC	1.493	1.511	ST	6F	INSTRUCTIONAL TECHNOLOGY
RM33T23	NPRDC	1.444	1.498	ET	6	EDUCATION AND TRAINING TECHNOLOGY
RM33T24	NTSC	1.123	1.203	ST	6	SIMULATION AND TRAINING DEVICE TECHNOLOGY
		----- 6.701	----- 6.951			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62233N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	----- 6.700	----- 6.950

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
62234N					SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA
RS34H20	NOSC	3.550	3.700 HF	4	HUMAN FACTORS TECHNOLOGY
RS34H21	NPRDC	0.600	0.550 HF	5A	BIOPSYCHOMETRIC ASSESSMENT
		4.151	4.251		TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62234N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	4.150	4.250

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
63701N					HUMAN FACTORS ENGINEERING DEVELOPMENT
R1771	NOSC	1.605	1.663 HF	4	SHIP HUMAN FACTORS ENGINEERING DEVELOPMENT
W0542	NADC	0.849	0.880 HF	4	AIR HUMAN FACTORS ENGINEERING TECHNOLOGY
		----- 2.454	----- 2.544		TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63701N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	----- 2.454	----- 2.543

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
63707N						MANPOWER AND PERSONNEL SYSTEMS
R1770	NPRDC	3.976	4.115	MP	2	MANPOWER AND PERSONNEL SYSTEMS
		-----	-----			
		3.977	4.115			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63707N :			FY89		FY90	
			-----		-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			3.976		4.115	
-----						

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III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63720N						EDUCATION AND TRAINING
R1772	NPRDC	6.153	6.376	ET	6	EDUCATION AND TRAINING
		-----	-----			
		6.154	6.377			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63720N :						
						FY89
						-----
						6.153
						FY90
						-----
						6.376
-----						

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
=====					
63732M					ADVANCED MANPOWER/TRAINING SYSTEMS
C0073	HQMC	3.092	4.078 MP	1A	HUMAN RESOURCES MANAGEMENT AND FORECASTING
		-----	-----		
		3.092	4.079		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63732M :			FY89	FY90	
			-----	-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			3.092	4.078	
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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
63733N					SIMULATION AND TRAINING DEVICE TECHNOLOGY
W1773	NTSC	6.451	6.685 ST	6	SIMULATION AND TRAINING DEVICES
		----- 6.452	----- 6.686		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63733N :					FY89 ----- 6.451
THE PRESIDENT'S BUDGET, JANUARY 1989					FY90 ----- 6.685

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
63739N						NAVY LOGISTICS PRODUCTIVITY
T1885	NPRDC	0.976	1.187	HF	3	QUALITY IMPROVEMENT
T1886	NPRDC	0.488	0.259	HF	3	NEW TECHNOLOGY
		-----	-----			
		1.464	1.447			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63739N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	1.464	1.446

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### III-B-1: LISTING OF NAVY PROJECTS

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715N						SURFACE WARFARE TRAINING
S1126	NTSC	0.044	0.000	ST	6	SURFACE TOMAHAWK TRAINER
S1140	NTSC	2.484	0.999	ST	6	TACTICAL ADVANCED COMBAT DIRECTION ELECTRONIC WARFARE (TACDEW) MODIFICATION
S1427	NTSC	11.193	7.395	ST	6	SURFACE TACTICAL TEAM TRAINER
S1436	NTSC	1.451	0.000	ST	6	SURFACE WARFARE TRAINING ANALYSIS
S1834	NTSC	3.581	9.293	ST	6	LANDING CRAFT AIR CUSHION (LCAC) OPERATOR TRAINER
		----- 18.753	----- 17.688			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 64715N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	----- 18.753	----- 17.687

### III.C. AIR FORCE PROGRAM ELEMENT AND PROJECT SYNOPSES

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PE	TITLE	PAGE
61102F	DEFENSE RESEARCH SCIENCES	III-C-1
62202F	HUMAN SYSTEMS TECHNOLOGY	III-C-7
62205F	PERSONNEL, TRAINING AND SIMULATION	III-C-12
63106F	LOGISTICS SYSTEMS TECHNOLOGY	III-C-29
63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY	III-C-34
63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY	III-C-46
64227F	FLIGHT SIMULATOR DEVELOPMENT	III-C-50
64243F	MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT	III-C-68

Table III-C-1: Listing of Projects - Lists projects for each AIR FORCE program element. Lists contain performing organization, funding, Congressional Category and goal information.

III-C-1

## PROGRAM ELEMENT OVERVIEW

PE: 61102F                      DEFENSE RESEARCH SCIENCES

CONGRESSIONAL CATEGORY:      HUMAN FACTORS  
                                 MANPOWER & PERSONNEL

DoD ORGANIZATION:            AF

FUNDING:                      FY89 \$ 9.1M (FY90 PRESIDENT'S BUDGET)  
                                 FY90 \$ 9.0M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objectives of the Manpower, Personnel and Training (MPT) portion of this Program Element are to: (a) improve selection of personnel for appropriate jobs on the basis of measured mental abilities and sensory-motor skills, (b) design equipment to optimally match human information processing characteristics, and (c) monitor human workload and performance.

This Science and Technology Base Program Element exclusively supports Air Force research efforts, comprised of in-house investigations in Air Force Laboratories and extramural activities in academia and industry. The Program Element funds broad-based scientific and engineering basic research dedicated to stimulating new ideas in areas pertinent to the Air Force mission: (a) aerospace structures and aerodynamics, (b) materials, propulsion and power, (c) electronics, (d) computer science, (e) directed energy and conventional weapons, (f) life sciences, and (g) terrestrial, atmospheric, and space sciences. The efforts contained in this program do not duplicate tasks conducted under the Strategic Defense Initiative, or under the University Research Initiative.

New research initiatives in FY89 include: (a) multi-functional wafer level union, (b) nonlinear interactive flow control and flight mechanics, (c) neurophysiology of sensory information processing, and (d) constituent mechanics of inhomogeneous materials.

The planned new initiatives for FY90 include: (a) turbulence simulation, (b) polymer/polymer interactions, (c) quantum devices, (d) fatigue and fracture, (e) chronobiology, (f) spatial orientation, (g) optimal design, (h) signals to symbols, (i) electro-optical techniques for millimeter wave integrated circuits, and (j) reaction control by positive feedback from internal energy. The effort also enhances the Air Force research capability by improving the technological base in those areas crucial to the Air Force. Examples are: (a) support of a summer faculty and graduate student program wherein university researchers spend ten weeks during the summer working at an Air Force laboratory, (b) a resident research associateship and university resident research program wherein researchers can spend up to a year at an Air Force laboratory, and (c) several graduate assistantships and laboratory graduate fellowship programs in technology areas of critical interest to the Air Force.

Specifically, for the MPTS portion of this PE, in FY89 it is planned to merge, through an initiative in sensory neurophysiology, the study of neural circuits in sensory systems and the study of how information is processed in seeing and hearing. This will yield an improved understanding of our sensory mechanisms.

In FY90, it is planned to examine the sensory functions underlying spatial orientation and disorientation.

In FY91, it is planned to (a) continue examination of cognitive functions underlying spatial orientation and disorientation, and (b) stimulate collaboration between neuroscientists and experimental psychologists studying the neural mechanisms of skilled performance.

## RELATED ACTIVITIES:

Program coordination among government agencies is achieved through annual interagency meetings and data exchange with the Army, Navy, National Science Foundation, Department of Energy, National Aeronautics and Space Administration (NASA), Federal Aviation Administration, Defense Advanced Research Projects Agency, Defense Nuclear Agency, and other Federal research activities. Other means of coordination include annual briefings to the Under Secretary of Defense for Research and Engineering, attendance at technical symposia and topical reviews covering research areas of common interest. Examples of coordinating and joint activities are: (a) a joint program in hypersonic aerodynamics is conducted in conjunction with the Navy and NASA, (b) cloud physics is being jointly funded with the Navy and the Army using a jointly-funded facility, (c) a joint-Services Electronics Program supports relevant research at universities to solve military electronics problems, (d) an Interagency Working Group on Neuroscience coordinates efforts among federal agencies, and (e) mathematical sciences are coordinated through the Interagency Committee for Extramural Mathematics Programs. In addition, particularly effective coordination is accomplished on an informal basis among individual Air Force program managers and their counterparts in other agencies.

The Air Force basic research program is conducted in Air Force laboratories and under extramural grants and contracts with academic institutions and industry. The entire program is managed by the Air Force Office of Scientific Research. Research now underway includes in-house efforts at the Air Force Wright Aeronautical Laboratories, Air Force Armament Laboratory, Air Force Weapons Laboratory, Air Force Rocket Propulsion Laboratory, Air Force Geophysics Laboratory, Air Force Human Resources Laboratory, USAF School of Aerospace Medicine, Armstrong Aerospace Medical Research Laboratory, Frank J. Seiler Research Laboratory, USAF Academy, and the Rome Air Development Center.

The Human Resources Project of this Program Element provides the knowledge required to ensure that Air Force personnel can operate, maintain, and manage complex equipment systems in demanding environments.

## PAYOFF/UTILIZATION:

The payoff of the MPTS portion of this Program Element is enhanced knowledge which can: (a) help in the development of new training devices, (b) improve the methods of assessment and prediction of human abilities for better selection and training, and (c) enhance the design of manned weapons systems.

## FUTURE DIRECTIONS:

Major thrusts for several years will continue in the areas of: (a) visual information processing, (b) development of new workload metrics based on researching new biocybernetics techniques, and (c) performance prediction based on systematic investigation of parameters of learning ability. Several reviews of contract and in-house work are held each year in the thrust areas. These are a valuable source of information exchange since representatives of other military services and agencies are invited to participate.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2313-A4	COGNITIVE SCIENCE	\$ 7.9M	\$ 7.9M
PE: 61102F	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE OFFICE OF SCIENTIFIC RESEARCH		

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PROJECT SYNOPSIS:

The objective of this Task is to support basic research in cognitive science.

This research program will support basic theoretical and experimental work on human cognitive processing, including areas such as of perception, attention, working memory, spatial processing, long-term memory representations, natural reasoning, problem solving, decision making, and skill acquisition. The study of any of these topics under conditions of heavy cognitive demand is especially appropriate. Both behavioral and biological approaches will be considered, and other topics may also be included as the program develops.

A portion of this new program will provide awards to scientists at the Air Force Human Resources Laboratory, where a large test facility has been built for research on human learning abilities. This unique facility includes 30 testing stations with microcomputers and associated equipment and a mainframe computer for reducing data. Several hundred new subjects are available for testing each week. A current research project is measuring individual differences in processing speed and working memory capacity to predict learning performance; however, many other studies are planned. Awards will support visits to this facility for collaborative research.

Plans for the FY89 program include the continuation of the cognitive program, with strong commitment to both Air Force laboratory and university research.

## PAYOFF/UTILIZATION:

The payoff of this Task will be improved understanding of human cognitive processing. The goal of this program is to support theoretical and experimental research that illuminates the fundamental mechanisms underlying human performance. Research using behavioral methods alone or a combination of behavioral and biological or computational methods will be supported.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2313-T1	LEARNING ABILITIES	\$ 0.9M	\$ 0.9M
	MEASUREMENT PROGRAM		
PE: 61102F	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Task is to develop a theory-based system of ability measurement that will account for individual differences in skill/knowledge acquisition rates and performance levels.

New techniques are needed for evaluating the fundamental parameters of processing speed, working memory capacity, and knowledge bases which determine individual learning and performance behaviors. Advances in cognitive psychology and other measurement devices make a breakthrough possible in ability measurement. Advances in ability measurement depend upon the availability of reliable and valid indicators of learning and performance proficiency. Basic research is needed to develop and test alternative ways of evaluating learning rates and performance capabilities.

Studies in the skill acquisition area will be conducted to identify and measure individual difference parameters relating to procedural and factual knowledge bases, working memory capacity, and information processing speed. A primary goal is to determine how such parameters interact to account for individual differences in learning and performance behaviors. Studies will be conducted to determine the role of processing speed to model learning and performance in high information flow environments.

A second area of research will identify and measure working memory capacity. The approach will be to model latencies and errors (memory failures) on tasks involving various combinations of memory storage and processing requirements. Additional research in skill acquisition will address individual differences in the attainment and maintenance of automaticity in the numerical, verbal, and spatial domains, and will support program and system analysis for development of specialized tests.

Research in performance assessment will try to determine how various measures of learning behavior can be combined into the most meaningful indicators of learning performance. Such performance scores will be modeled using knowledge, capacity, and processing speed parameters. In addition, the principles of artificial intelligence (AI) will be applied to develop intelligent tutors in the areas of programming and electronic troubleshooting. The goal of the research is to develop two seven-day courses which can be used to collect learning performance criteria to be modeled using ability parameters.

This initiative supports research collaborations between leading university scientists and the Air Force Human Resources Laboratory, at which a major computer facility for aptitude testing has been developed.

## PAYOFF/UTILIZATION:

The payoffs of this task include: (a) provision of a theory-based system of ability measurement which will lead to an improved Air Force personnel

selection and classification program, (b) development of new methods for evaluating individual differences in learning and performance that can be used for early validation of ability measures, and (c) provision of a model of the ways in which learned capabilities develop.



## PROJECT OVERVIEW

		89	90
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PROJECT: 2313-T3	PERCEPTUAL AND COGNITIVE	\$ 0.3M	\$ 0.3M
	DIMENSIONS OF PILOT		
	BEHAVIOR		
PE: 61102F	DEFENSE RESEARCH SCIENCES		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objectives of this Task are to: (a) establish the relationship between stimulus properties and their encoding by basic sensory mechanisms, and (b) determine the limits/capabilities of human visual attention and develop a predictive model of those effects.

Specific research will include: (a) measuring the interaction of stimulus size, location, spatial frequency and temporal frequency on the discrimination of visual motion effects, (b) measuring spatial summation effects in short wavelength receptor mechanisms and compare these effects with alternative theoretical predictions, (c) determining the directional sensitivity of short wavelength mechanisms utilizing a stimulus matching technique, and (d) comparing dynamic transformations in spatial contours in terms of their effects on perceptual constancies.

Additional research is planned to: (a) measure the speed of voluntary and involuntary attentional switches for highly practiced visual tasks, (b) determine to what extent improvements in voluntary attentional speed for single stimuli generalize to multiple stimuli and locations, (c) develop and refine an artificial intelligence-based model of visual attention, and (d) test predictions of the artificial intelligence model for fixation sequences in a visual scanning task.

## PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) provision of basic information on sensory and perceptual processes which can affect the design of training systems for Air Force pilots, and (b) establishment of a basis for the prediction, measurement, and correction of attentional errors during the training of advanced cockpit piloting tasks.

## PROGRAM ELEMENT OVERVIEW

PE: 62202F HUMAN SYSTEMS TECHNOLOGY  
 CONGRESSIONAL CATEGORY: HUMAN FACTORS  
 DoD ORGANIZATION: AF  
 FUNDING: FY89 \$ 11.4M (FY90 PRESIDENT'S BUDGET)  
 FY90 \$ 12.4M (FY90 PRESIDENT'S BUDGET)

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PE SYNOPSIS:

The objectives of this Program Element optimize human aspects of the man-interface with weapon systems.

Thrusts of this Science and Technology program are to: (a) improve human performance in weapon systems and operations by refining crew selection, maintenance, crew protection, and man-machine integration, (b) improve safety and protect Air Force personnel from radiation, chemical, and mechanical forces, (c) use our understanding of human factors to invent threats and countermeasures effective against Soviet weapon system operators, and (d) develop defense measures for air base operations, casualty care evacuation, and personal protective equipment.

This Program Element also provides management and operational support for the three laboratories of the Human Systems Division.

The in-house developing organization responsible for this program is the Human Systems Division through its three laboratories: the United States Air Force School of Aerospace Medicine, the Armstrong Aerospace Medical Research Laboratory, and the Air Force Human Resources Laboratory.

## RELATED ACTIVITIES:

The Program is formally coordinated with the Army, Navy and National Aeronautics and Space Administration through a variety of mechanisms including the Tri-Service Aeromedical Research Panel, the DoD Human Factors Engineering Technical Advisory Group, and the Armed Services Biomedical Research Evaluation and Management (ASBREM) Program. Where coordination is required on a daily basis, operating locations have been established with other organizations. These include Air Force positions with Headquarters Naval Medical Research and Development Command, the Naval Medical Research Institute, and NASA. Data Exchange Agreements (DEAs) on testing of air and ground crew equipment are used to facilitate international cooperation.

Related Program Elements include: 0602720A, Environmental Quality Technology; 0602777A, Systems Health Hazard Prevention Technology; 0602205F, Training /Simulation Technology; 0603227F, Advanced Simulator Technology; 0603231F Crew Systems and Personnel Protection Technology; 0604703F, Aeromedical/Chemical Defense Systems Development; 0604706F, Life Support System 412A; 0604601F, Chemical/Biological Defense Equipment; 0702986F, Clothing Development; 0602204F, Aerospace Avionics; 0602702F, Command, Control, Communications; and 0601102F, Defense Research Sciences. Related flight dynamics Program Elements include: 0602201F, Aerospace Flight Dynamics; 0603205F, Flight Vehicle Technology; and 0603245F, Advanced Fighter Technology Integration. Related Army non-medical Program Elements include: 0602622A, Chemical and Smoke Technology; 0603806A, Chemical/Biological Defense; 0603803A, Chemical Systems Advanced Development; 0603759A, Chemical Biological Advanced Technology; 0604803A, Chemical Systems Engineering Development; 0604806A, Chemical Biological Radiological Defense Equipment Engineering Development; 0605710A, Joint Chemical Biological Point of Contact Test and Assessment; and 0601102A, Defense Research Sciences. Related Army medical Program Elements include: 0602787A, Medical Defense Against Chemical

Warfare; 0603751F, Medical Defense Against Chemical Warfare; 0604757A, Medical Chemical Defense; and 0603002A, Medical Defense Life Support Material. Related Navy Program Elements include: 0602233N, Mission Support Technology; and 0604506N, Chemical Warfare Countermeasures.

There is no unnecessary duplication of effort within USAF or DoD.

**PAYOFF/UTILIZATION:**

The payoffs of this Program Element include: (a) the design of more effective weapon systems which capitalize on advanced human engineering concepts and techniques, (b) the development of technologies to assess human performance on space flights, (c) the development of command, control and communications (C3) simulation systems for interactive testing, (d) the development of advanced display and simulation technology for tactical aircraft systems, and (e) the development of systems to maximize human operator efficiency.

**FUTURE DIRECTIONS:**

In FY91, for the Manned Weapon Systems Effectiveness Project, it planned to: (a) assess methodologies to deceive infrared sensors and high resolution detection techniques of new radars systems, and (b) test man's capability to perform operationally oriented visual tasks while on-orbit.

In FY91, for the Man-Machine Integration Technology Project, it is planned to: (a) specify the design for the second generation of the Super Cockpit initiative, including 3-dimensional imaging and vision and voice-actuated systems, and (b) develop a miniaturized helmet-mounted cathode ray tube display with full color imaging.

## PROJECT OVERVIEW

		89	90
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PROJECT: 06MD	HUMAN SYSTEMS DIVISION	\$ 4.1M	\$ 4.5M
	LABORATORY OPERATIONS		
PE: 62202F	HUMAN SYSTEMS TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	HSD		

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PROJECT SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Project is to provide the resources to conduct MPT in-house research and development activities of the Human Systems Division research laboratories.

The laboratories are designed to specifically define man's limits with regard to adaptability, survivability, and performance capabilities within his operational environment. The Project includes pay and related costs for civilian employees, travel, transportation, rent, communications, utilities, lab supplies and equipment, and other related materials and services needed by specialized scientific teams using complex, unique research facilities and devices to conduct biotechnology research and exploratory development. This Project also funds salary, travel and equipment for personnel at the Aeronautical Systems Division to provide procurement support to the Human Systems Division.

Funding indicated includes only the MPT portion of this Project.

In FY89/90 it is planned to continue to provide operations support to the Project.

## PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Project includes the provision of resources to enable the in-house MPT research and development activities of the Human Systems Division and its laboratories to be conducted.

This Project allows and facilitates the research efforts of the Aerospace Biotechnology Program (the core Air Force technology base program) to optimize the role of the human operator in the design, development, and operation of increasingly complex and technologically sophisticated weapon systems.

## PROJECT OVERVIEW

		89	90
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PROJECT: 6893	MANNED WEAPON SYSTEMS EFFECTIVENESS	\$ 1.4M	\$ 1.4M
PE: 62202F	HUMAN SYSTEMS TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	HSD		

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PROJECT SYNOPSIS:

The objective of this Project is to develop techniques to deceive the operators of enemy air-to-ground and ground-to-air systems.

Visual camouflage, optical countermeasures and techniques to defeat infrared and radar sensors are developed, simulated in the laboratory, and field tested. A variety of studies of human perceptual capacities are also performed. Measurement of enemy anti-aircraft operator performance is accomplished with simulation and flight tests. Blue forces countermeasures are being developed and delivered to the Tactical Air Command, and USAF Europe.

In FY89, it is planned to: (a) develop a special telescope to allow observation from orbital altitude of terrestrial objects to determine human pointing, tracking and visual performance in space, and (b) develop a method to effectively simulate and predict enemy responses during various combat scenarios.

In FY90, it is planned to: (a) determine the effectiveness of optical countermeasures associated with F-15 and F-16 decoy flight tests, and (b) assess the threat to penetrating air base defenses as posed by manned systems such as the B-2.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved survivability against enemy threat systems, (b) validated criteria for simulator design, and (c) increased knowledge of manned threat system capabilities and vulnerabilities.

In FY88, specific accomplishments included: (a) demonstrating in field tests of visual deception techniques that air base survivability was improved by causing attacking aircrew to attack decoys, and (b) demonstrating the feasibility of an optically based passive terrain-avoidance system not requiring radar emissions, permitting unobserved penetration of enemy territory.

## PROJECT OVERVIEW

		89	90
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PROJECT: 7184	MAN-MACHINE INTEGRATION TECHNOLOGY	\$ 5.9M	\$ 6.5M
PE: 62202F	HUMAN SYSTEMS TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	HSD		

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PROJECT SYNOPSIS:

The objective of this Project is to develop procedures and technologies to optimize the interface between Air Force personnel and the weapon systems they operate.

This Project will: (a) develop basic information on the perceptual, cognitive and response characteristics of human operators within mission-specific scenarios to use as design point data for system control and display development, and (b) develop standardized man-in-the-loop simulation methods to measure the changes in weapon effectiveness as a result of changes in man-machine coupling.

In FY89, it is planned to: (a) complete an image-generating terminal for simulating air-to-air combat in a 3-dimensional viewing field, and (b) complete a brassboard helmet-mounted display system with a wide field-of-view for the Super Cockpit initiative (Program Element 0603231F, Crew Systems Technology).

In FY90, it is planned to: (a) evaluate the design of a strategic crew station intended to enhance information displays to the crew members during combat, and (b) design the display requirements for the first ejection-compatible tactical night vision system for improved night combat effectiveness.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) the improvement of weapon system performance by optimizing man-machine coupling, and (b) the development of methodologies and technologies to maximize the efficiency and effectiveness of the human operator interfacing with Air Force systems.

In FY88, specific accomplishments included: (a) designing a B-1B bomber defensive operator display system for use by Strategic Air Command aircrews, (b) developing a prototype human engineering workstation incorporating Artificial Intelligence to optimize tests on aircrew performance involving such factors as mental fatigue.

## PROGRAM ELEMENT OVERVIEW

PE: 62205F PERSONNEL, TRAINING, AND SIMULATION

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING  
HUMAN FACTORS  
SIMULATION & TRAINING DEVICES  
MANPOWER & PERSONNEL

DoD ORGANIZATION: AF

FUNDING: FY89 \$ 30.9M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 29.0M (FY90 PRESIDENT'S BUDGET)

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PE SYNOPSIS:

The objective of this Program Element is to improve operational readiness and effectiveness by developing technologies to enable more effective training, selection, assignment, and retention of personnel, as well as technology to increase weapon system supportability.

Research efforts to improve aircrew training use various flight simulation devices to: (a) define simulator fidelity requirements to enable effective training, (b) develop total training system designs, and (c) develop innovative techniques for training tactics for air-to-ground and air-to-air combat.

Other technical programs include development and demonstration of improved: (a) individual and unit training methods, instructional and learning strategies, (b) training design and evaluation technologies, (c) personnel testing procedures, (d) methods to determine Air Force job requirements, (e) processes for matching individuals to jobs, (f) technologies to measure and evaluate job performance in order to link enlistment standards to on-the-job performance, (g) methods and models for training planning and training decision making, models for integrating manpower, personnel and training decisions during weapon system design, and (h) methods and tools for computer-based training development and delivery, and artificial intelligence-based training systems.

Another major R&D area addresses the logistics support of weapon systems and improvements that can be made by specifying the interactions between the human elements of the logistics and maintenance systems, and the associated characteristics of weapon systems.

This program also provides management and operational support for the Air Force Human Resources Laboratory, Brooks AFB, TX.

The in-house developing organization responsible for this program is the Air Force Human Resources Laboratory (AFHRL). Four laboratory divisions support this Program Element: Manpower and Personnel Division, Logistics and Human Factors Division, Operations Training Division, and Training Systems Division.

## RELATED ACTIVITIES:

Related Program Elements are: 0601102F, Defense Research Sciences; 0602202F, Human Systems Technology; 0602204F, Aerospace Avionics; 0602702F, Command, Control, and Communication; 0602763N, Personnel and Training Technology; 0603707N, Manpower Control System Development; 0602717A, Human Performance Effectiveness and Simulation; 0603106F, Logistics Systems Technology; 0603227F, Manpower, Personnel, Training, and Simulation Technology; 0603231F, Crew Systems Technology; 0604227F, Flight Simulator Development; 0602757N, Human Factors and Simulation Technology; 0603733N, Training Devices Technology; 0603720N, Education and Training; 0602722A, Manpower, Personnel, and Training; 0602727A, Non-System Training Devices Technology; and 0603211A,

### Synthetic Flight Simulators.

The Human Resources Laboratory has formal agreements with: the Army Program Manager for Training Devices (PM TRADE), for visual display and advanced computer image generation technology development; Tactical Air Command for flying training R&D; Aeronautical Systems Division, Deputy for Training Systems, to coordinate flight simulator, aircrew and maintenance training system research and development; Wright Aeronautical Laboratories, for development of computer-aided design technology; the Army Research Institute, the Navy Personnel Research and Development Center, and the Naval Training Systems Center, to share development of a computerized instruction system and computer-based training R&D. There are also formal agreements with the Armstrong Aerospace Medical Research Laboratory and Rome Air Development Center, to share research products related to command and control systems. The Navy has a liaison office with the Operations Training Division at Williams AFB, AZ. Efforts to improve the Armed Services Vocational Aptitude Battery are directed, in part, by a tri-Service steering committee of General Officers. In addition, DoD Technical Advisory Groups provide coordination between specific focal points for research and development efforts. Efforts across all Services to develop job performance measures are coordinated by a joint-Services working group monitored by the Office of the Assistant Secretary of Defense for Force Management and Personnel.

### PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) increased operational readiness by developing technologies to enable more effective classification, assignment, training and retention of personnel, and (b) minimization of the manpower and equipment necessary to conduct maintenance.

### FUTURE DIRECTIONS:

In FY91, for the Laboratory Support Project, it is planned to continue to fund the operation of the Air Force Human Resources Laboratory, including pay and related costs of civilian scientists, engineers, and support personnel, travel, rent, communications, maintenance, supplies and equipment.

In FY91, for the Technical Training Development Project, it is planned to: (a) determine the effectiveness of using neural networks to train and control intelligent tutors, (b) continue experiments on the effectiveness of different instructional approaches in intelligent training systems, (c) continue development of machine learning and knowledge-based instructional planning technologies, and (d) continue experiments on the effectiveness of computer-based training for various Air Force applications.

In FY91, for the Flying Training Development Project, it is planned to: (a) develop a model incorporating visual training effectiveness data to optimize simulator fidelity variables for aircrew combat training and mission rehearsal, and (b) begin development of an expert system for training tactical air combat pilots in decision making.

In FY91, for the Advanced Simulation for Pilot Training, it is planned to continue to provide engineering support for the Flying Training Development Project and the Flight Simulator Technology Project, as well as on-site contractor maintenance and modification of the R&D flight simulation equipment and software, including computer image generation systems, dome and helmet-mounted visual displays, database development systems, and simulator control computers.

In FY91, for the Logistics and Maintenance Technology Project, it is planned to: (a) develop computer-aided design tools to incorporate data on human capabilities in space into design of new systems, (b) develop advanced models to predict the impact of operational scenarios on combat logistics requirements, and (c) develop prototype training methods to enable maintenance personnel to cope with combat stress and maintain acceptable levels of performance.



In FY91, for the Command and Control Training Project, it is planned to: (a) develop an artificial intelligence based embedded training program for Tactical Air Control Center battle managers, and (b) continue development of improved training methods for individual and team battle management decision making.

In FY91, for the Flight Simulator Technology Project, it is planned to: (a) develop design guidelines for electronic warfare trainers, (b) demonstrate long-distance interactive operation between the Operations Training Division at Williams AFB, Naval Training Systems Center, and Fort Rucker, and (c) begin development of technologies supporting rapid database development necessary for simulator mission rehearsal.

In FY91, for the Force Acquisition and Distribution Systems Project, it is planned to: (a) expand previous models quantifying the value of experience to develop an objective force structure analysis model, (b) develop a model to link Air Force enlisted and officer accessions and retention, and civilian availability to estimate supportability and maintainability of future weapon systems, and (c) begin development of a Total Force Impact Model to specify supportable manpower, personnel, and training constraints for use in early weapon system planning documents and provide design criteria to weapon system developers.

In FY91, for the Force Management Systems Project, it is planned to: (a) continue experiments to refine and validate methods, tools, and models for training planning/decision making, (b) determine the feasibility of integrating job performance information with training planning/decision technologies, and (c) continue development of methodologies for identifying areas of over- and under-training based on job performance.

## PROJECT OVERVIEW

		89	90
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PROJECT: 06HT-ET	LABORATORY SUPPORT	\$ 3.0M	\$ 3.4M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

## PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas, to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

## PROJECT OVERVIEW

		89	90
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PROJECT: 06HT-HF	LABORATORY SUPPORT	\$ 1.9M	\$ 2.2M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

## PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

## PROJECT OVERVIEW

		89	90
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PROJECT: 06HT-MP	LABORATORY SUPPORT	\$ 2.1M	\$ 2.5M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

## PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

## PROJECT OVERVIEW

		89	90
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PROJECT: 06HT-ST	LABORATORY SUPPORT	\$ 3.2M	\$ 3.7M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

## PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

## PROJECT OVERVIEW

		89	90
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PROJECT: 1121	TECHNICAL TRAINING DEVELOPMENT	\$ 2.0M	\$ 1.9M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to enhance and develop training technologies that will result in improved methods for individual skills development and better job performance through enhanced individual and unit training.

Primary areas of interest include: (a) using computers to investigate and measure job performance, (b) developing computer-based training (CBT) delivery, management, and evaluation systems, and (c) investigating and demonstrating artificial intelligence (AI) applications for training.

In FY89, it is planned to: (a) determine parameters for deciding when computer-based job aids are more cost effective than additional training, and (b) determine the most effective instructional sequencing and delivery strategies for computer-based training for maintenance and space operations.

In FY90, it is planned to: (a) begin experiments on the effectiveness of different instructional approaches in intelligent training systems, (b) determine the value and use of case-based reasoning and qualitative reasoning in Air Force technical training, (c) continue development of software tools to enable training developers to create intelligent computer-based training courses without the assistance of computer programmers, (d) determine the feasibility of using neural networks to construct individualized student models in order to enhance the performance of intelligent tutoring systems, and (e) begin investigations regarding machine learning and knowledge-based instructional planning.

## PAYOFF/UTILIZATION:

The payoffs of this Project are improved quality and cost effectiveness of technical training for Air Force enlisted maintenance and support personnel by developing technology to accelerate learning, increase skill/knowledge retention, and improve job performance. This Project will develop cost effective methods for designing, delivering, and evaluating training, and determine the most effective uses of computer technology for training.

In FY88, specific accomplishments included: (a) developing an expert system which provides realtime guidance to students during equipment operation training, and (b) developing software to partially automate creation of training systems incorporating artificial intelligence.

## PROJECT OVERVIEW

		89	90
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PROJECT: 1123	FLYING TRAINING DEVELOPMENT	\$ 2.8M	\$ 2.1M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

## PROJECT SYNOPSIS:

The objective of this Project is to develop new methods and techniques for aircrew training.

This Project will investigate the entire spectrum of aircrew training required for a weapon system to determine the best ways of designing, delivering and assessing ground based and aircraft training.

In FY89, it is planned to: (a) begin development of a modular threat simulation system to support the development and evaluation of integrated full-mission electronic combat training, (b) determine flight simulator critical visual cues for low-level flight and performance effects of trade-offs in scene brightness, resolution, and contrast, (c) identify critical factors in cockpit resource management and develop training to improve related aircrew skills, and (d) conduct experiments on sensor scene fidelity to specify simulation requirements for ground radar resolution and infrared displays.

In FY90, it is planned to: (a) demonstrate a stand-alone aircrew performance measurement system, capable of acquiring data from flight simulators, as well as Air Combat Maneuvering Instrumentation Ranges, (b) complete development of an artificial intelligence model of pilot knowledge structures, to evaluate air combat decision-making strategies and develop improved training methods, (c) determine the training value and optimal use of computer generated special effects, such as smoke, contrails, explosions, and sun angle shading in flight simulators, (d) define simulator display requirements for combat training with respect to color, scene content, and field-of-view, (e) determine the effectiveness of augment cueing (e.g., adding color or detail to an object in order to increase detectability) for training and other applications, and (f) develop guidelines for the display of tactical air combat performance information for training purposes.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) reduced costs for all types of flying training, (b) improved ability to effectively train aircrew personnel, (c) new instructional methods, techniques, and devices for training and assessing pilot and navigator performance at both undergraduate and combat crew levels, (d) increased student and aircrew proficiency, (e) increased survivability and mission effectiveness, (f) development of effective visual simulation requirements, (g) improved use of simulators, and h) improved simulator displays.

In FY88, specific accomplishments included: (a) determining that low cost, artificially enhanced digital imagery could effectively simulate synthetic aperture radar and satisfy operational B-1 simulator training requirements, and (b) determining that successive reductions in the instantaneous field-of-view available in the C-130 flight simulators resulted in

corresponding reductions in pilot performance during low altitude maneuvering in the simulator.



## PROJECT OVERVIEW

		89	90
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PROJECT: 1192	ADVANCED SIMULATION FOR PILOT TRAINING	\$ 5.5M	\$ 4.9M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to provide engineering support for the Flying Training Development Project (Project 1123) and the Flight Simulator Technology Project (Project 6114), as well as on-site contractor maintenance and modification of the R&D flight simulation equipment and software, including computer image generation systems, dome and helmet-mounted visual displays, database development systems, and simulator control computers.

## PAYOFF/UTILIZATION:

The payoffs of this Project include the advancement of simulation concepts and technology.

Efforts of this Project are central to research and development work of other Projects, and thus play a vital role in advancing the state of training systems in general and contributing to knowledge on transfer of training and the generalizability of skill acquisition. These are significant training issues across the Services, as cost-effectiveness and training efficacy become increasingly important in a technologically sophisticated military environment.

## PROJECT OVERVIEW

		89	90
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PROJECT: 1710	LOGISTICS AND	\$ 3.6M	\$ 3.0M
	MAINTENANCE TECHNOLOGY		
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objectives of this Project are to: (a) develop new technologies to improve the logistics support of Air Force Combat and peacetime operations, (b) develop improved models for logistics planning and assessment to provide realistic computation of wartime logistics requirements and capabilities, (c) develop methods to identify trade-offs in personnel, job aids, and support equipment to minimize the manpower and equipment necessary to conduct aircraft maintenance in dispersed locations, and (d) develop software tools to enable weapon systems designers to design improved reliability, maintainability, supportability, and man-machine interfaces.

In FY89, it is planned to: (a) begin development of improved, computer-based reliability and maintainability design evaluation measures and criteria for use by program directors and engineers during weapon system development, (b) develop user-friendly computer techniques to enable rapid development and use of capability assessment models, and (c) begin development of methods to identify critical maintenance tasks to be performed in emergency situations (both combat and domestic) and the training requirements associated with those contingencies.

In FY90, it is planned to: (a) continue development of combat-portable maintenance aids, with special emphasis on providing capability for in-field training and aircraft battle damage repair estimating, (b) continue development of advanced computer-aided design graphics to allow estimation of maintainability and system operation while the system is still in the early design stages, and (c) continue development of improved simulation models to enable enhanced analysis of Air Force-wide combat logistics resource requirements.

## PAYOFF/UTILIZATION:

The payoffs of this Project are to develop technologies for improving the logistics support of Air Force combat units. Acquisition of weapon systems that are logistically supportable, sustainable, and cost-effective is being emphasized by all levels of the Air Force and DoD. Military systems must be durable, easily maintained/repared in the field, and require little or no support equipment.

In FY88, specific accomplishments included compiling a list of flightline maintenance tasks which can be completed, partially completed, or not performed by personnel wearing chemical/biological warfare protective clothing and the associated physiological demands for performance of those tasks.

## PROJECT OVERVIEW

		89	90
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PROJECT: 3017	COMMAND AND CONTROL TRAINING	\$ 1.4M	\$ 1.1M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objectives of this Project are to: (a) develop methods for analyzing peacetime/wartime command and control job performance and training requirements, and (b) develop new training and evaluation methods for decision making and command and control team performance.

In FY89, it is planned to: (a) develop and evaluate preliminary models to allow systems designers to predict the impacts of automation on previously manual command and control systems, and (b) develop a proof-of-concept rapid training system for Headquarters Pacific Air Force battlestaff augmentees.

In FY90, it is planned to: (a) continue development of models to define and replicate high performance decision making skills of tactical battlestaffs, and (b) continue development of models to predict impact on training requirements and team performance of command and control system automation.

## PAYOFF/UTILIZATION:

The payoff of this Project is, through emphasis on training, to enable optimal use of complex command and control information systems.

In FY88, specific accomplishments included conducting a field demonstration of an automated tool to analyze command and control training requirements that promises to significantly reduce the cost and manpower required to develop a new command and control training system.

## PROJECT OVERVIEW

		89	90
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PROJECT: 6114	FLIGHT SIMULATOR TECHNOLOGY	\$ 1.2M	\$ 0.8M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to develop flight simulator component hardware technologies for future aircrew training systems, to reduce the cost of aircrew training systems and to provide new capabilities for realistic combat training.

In FY89, it is planned to: (a) begin a tri-Service effort with the Naval Training Systems Center and the Army Research Institute to develop local and long distance communications networking standards for linking aircraft, tank, and helicopter simulators, and (b) demonstrate the feasibility to rehost high fidelity simulation and support software from large minicomputers to inexpensive microprocessor systems, significantly reducing the cost of flight simulators.

In FY90, it is planned to: (a) continue development of the tri-Service simulator networking standards, and (b) begin development of design and utilization guidelines for part-task trainers for the Major Air Commands.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved quality and cost-effectiveness of training through determination of what types of simulator technology are most effective for specific training requirements, (b) improved simulation techniques which capitalize on human characteristics to provide cost-effective training devices, and (c) development of system definitions for future fully-capable, complex combat mission trainers for the tactical Air Force.

In FY88, specific accomplishments included: (a) demonstrating the feasibility of using low cost image generation architecture to simulate real-beam radar, and (b) completing development of a low-cost ground-mapping digital radar generator for flight simulators.

## PROJECT OVERVIEW

		89	90
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PROJECT: 7719	FORCE ACQUISITION AND DISTRIBUTION SYSTEM	\$ 3.4M	\$ 2.8M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objectives of this Project are research and development of personnel qualification and aptitude tests, job specification standards, and manpower and personnel models in order to provide the Air Force with methods to ensure that the Air Force recruits, selects, classifies, and assigns the best qualified individuals.

Experimental test batteries will be developed in areas such as attention sharing, eye-hand coordination, information overload, self-confidence, and others.

As the DoD Executive Agent for the Armed Services Vocational Aptitude Battery (ASVAB), which is used by all the Services for selection and classification of enlisted members, the Air Force must provide the technology base for revising and updating this test.

In FY89, it is planned to: (a) determine the ability of the various job performance measures to reliably capture the performance of technicians and examine the interrelationships among the measures, (b) continue development of measures to predict suitability for fighter, bomber, tanker, or transport aircraft training, and (c) determine the feasibility of using the enlisted value-of-experience model for evaluating rated career fields.

In FY90, it is planned to: (a) continue development of methods to determine the common higher order intellectual tasks from a group of related Air Force jobs to improve training effectiveness and efficiency, (b) develop methods to predict personality, motivational, and leadership qualities, for officer selection/classification, (c) begin development of a transferability of skills matrix based on the ease of retraining across Air Force jobs, and (d) evaluate candidate classification models for Specialized Undergraduate Pilot Training.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved selection techniques, (b) improved matching of Air Force personnel to jobs which most closely relate to their aptitudes, interests, and skills, with resultant benefits for both the Air Force and its personnel, (c) enhanced combat readiness by ensuring that Air Force personnel have the skills necessary to perform successfully in peacetime and combat, (d) improved air-combat performance, (e) improved pilot selection and specialized assignment placement, (f) reduced pilot training attrition, resulting in significant savings, and (g) establishment of the relative value of Air Force personnel with different levels and types of skills, thereby enabling Air Force managers and planners to respond in a more informed manner to dwindling manpower pools, decreased retention, budgetary constraints, and policy decisions.

In FY88, specific accomplishments included: (a) developing and demonstrating

a model to determine the value or cost of replacement of experienced enlisted personnel, (b) developing a computer model to predict the impact on technical training requirements from combining Air Force specialties, and (c) developing an enlisted classification model which optimizes the match between jobs and individual skills/aptitudes.

## PROJECT OVERVIEW

		89	90
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PROJECT: 7734	FORCE MANAGEMENT SYSTEM	\$ 0.8M	\$ 0.8M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to develop models, strategies and techniques to maintain a quality career force sufficient to meet mission requirements.

This Project is closely tied to a Congressional mandate to link selection procedures and enlistment standards to on-the-job performance measures. It involves development of on-the-job performance measures against which selection devices, such as the Armed Services Vocational Aptitude Battery, are to be validated. The Congressional direction to link enlistment standards to the on-the-job performance measures has resulted in close monitoring of this effort by the Office of the Assistant Secretary of Defense for Force Management and Personnel (OASD/FM&P).

In FY89, it is planned to: (a) begin experiments to refine and validate methods, tools, and models for training content identification, (b) demonstrate and evaluate alternative methods for automating the instructional systems development process, and (c) continue development of methods to create alternate training designs for Air Force specialties by projecting outcomes of various personnel utilization and training options.

In FY90, it is planned to: (a) continue development of methods to simulate current and alternative Air Force enlisted specialty structures, estimate training resource capacity and estimate training costs, and (b) develop methods to use job performance for a training content validity assessment.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved training effectiveness and reduced related costs through better design of the overall training programs, (b) improved evaluation of job performance, career motivation, job satisfaction, and individual/unit productivity, and (c) reduced premature separation from the Service and attrition from training.

In FY88, specific accomplishments included developing metrics to enable cost and training effectiveness comparisons of additional training at the technical school, field training detachments, or through on-the-job training.

## PROGRAM ELEMENT OVERVIEW

PE: 63106F                      LOGISTICS SYSTEMS TECHNOLOGY  
 CONGRESSIONAL CATEGORY:      HUMAN FACTORS  
 DoD ORGANIZATION:            AF  
 FUNDING:                      FY89 \$ 15.0M (FY90 PRESIDENT'S BUDGET)  
                                  FY90 \$ 9.6M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this Program Element is to serve as the primary technology development effort in support of the Department of Defense Computer-aided Acquisition and Logistics Support (CALS) initiative. CALS will replace the current voluminous and inefficient paper-based technical information system with efficient and easily updated electronic data management.

This Program Element will: (a) improve the way maintenance considerations are designed into weapons systems, (b) make engineering and maintenance data electronically available throughout the lifetime of weapons systems, (c) allow faster determination of the best balance of conflicting manufacturing and performance requirements for more reliable and supportable weapons, (d) provide more realistic computer-based logistics planning and combat capability assessment models, and (e) develop portable electronic job aids to assist maintenance technicians so that they can accomplish more kinds of diverse tasks.

This technology supports Rivet Workforce goals (e.g., reduce the number of maintenance specialties from twenty-four to six for the Advanced Tactical Fighter).

The in-house developing organizations responsible for this program are the Air Force Human Resources Laboratory, Logistics and Human Factors Division, and the Air Force Wright Aeronautical Laboratories.

## RELATED ACTIVITIES:

All Projects use applicable developments from Program Elements: #0602202F, Human Systems Technology; #0602205F, Personnel, Training and Simulation; #0603007A, Human Factors, Personnel and Training Advanced Technology; #0603205F, Aerospace Vehicle Technology; #0602201F, Aerospace Flight Dynamics; #0604740F, Computer Resource Management Technology; #0207219F, Advanced Tactical Fighter; #0604708F, Generic Integrated Maintenance Diagnostics System; #0603721N, Integrated Diagnostic Support.

There is no unnecessary duplication of effort within the Air Force or the Department of Defense (DoD). This program is fully coordinated with industry, through the Joint Logistics Commanders' (JLC) sponsored Technical Interchange Meetings, and through the Office of the Secretary of Defense (OSD) and the Service CALS Executive Steering Committees. IMIS is the Lead DoD Program for development of integrated maintenance aiding technology applicable to all three Services.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include Computer-aided Acquisition and Logistics Support (CALS) systems and technologies that will: (a) improve reliability and maintainability by enabling weapon system designers to include maintenance considerations as they create system designs on a computer-aided design (CAD) terminal, (b) make essential engineering and maintenance data electronically available throughout the lifetime of the



system, (c) allow rapid determination of the best balance of conflicting manufacturing and performance requirements for more reliable and supportable weapons, (d) provide the ability to integrate accurate wartime logistics data, resulting in more realistic computer-based logistics planning and combat capability assessment models, and (e) reduce the number of different kinds of maintenance specialists required to support each weapon system by using portable electronic job aids to assist individual technicians so that they can accomplish more kinds of diverse tasks.

#### FUTURE DIRECTIONS:

In FY91, for the Logistics for Combat Readiness Maintenance Project, it is planned to develop plans for the integrated test of a computer model which predicts the impact of reduced numbers of maintenance specialties with Project 2950, electronic flight line maintenance aids.

In FY91, for the Computer Technology for Systems Design and Maintenance Project, it is planned to: (a) improve computer-aided maintainability design by modeling multi-person team maintenance operations, (b) demonstrate access to technical data bases by Air Logistics Centers, Air Force Logistics Command, and contractors, and (c) demonstrate a design workstation for online trade-offs among R&M and supportability during system design.

In FY91, for the Integrated Maintenance Information System (IMIS) Project, it is planned to: (a) provide functional specifications for a flight line maintenance aiding system, (b) continue development to aid flight line maintenance with artificial intelligence systems, and (c) continue development of the Integrated Maintenance Information System (IMIS) functional demonstration prototype for a base-level field test.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2745	LOGISTICS FOR COMBAT	\$ 3.2M	\$ 0.1M
	READINESS MAINTENANCE		
PE: 63106F	LOGISTICS SYSTEMS TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to develop computer models and training methods to accurately predict requirements for people, spare parts, maintenance skills and repair activity associated with aircraft deployment, battle damage, and intense wartime use of weapon systems.

In FY89, it is planned to: (a) transfer \$3.1 Million to Program Element #0603001A, as directed by the Office of the Secretary of Defense, transfer \$3.1 Million to Program Element #0603001A, and (b) test a computer model which predicts the impact of reduced numbers of maintenance specialties.

In FY90, it is planned to work on a joint-Service application of the above mentioned computer maintenance model with the Army Research Institute.

## PAYOFF/UTILIZATION:

The payoffs of this Project include computer models and training methods that accurately predict the requirements for people, spare parts, maintenance skills, and repair activities that are associated with aircraft deployment, battle damage, and intensive wartime use of weapon systems.

In FY88, specific accomplishments included transitioning a classified database and existing analysis software to the DoD Survivability, Vulnerability Information Analysis Center, so that factors driving maintenance in combat can be identified through the analysis of actual combat data.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2940	COMPUTER TECHNOLOGY FOR	\$ 5.8M	\$ 3.9M
	SYSTEMS DESIGN AND		
	MAINTENANCE		
PE: 63106F	LOGISTICS SYSTEMS TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objectives of this Project are to: (a) develop and demonstrate Computer-Aided Design (CAD) technologies which will allow designers to incorporate reliability and maintainability(R&M), and logistics considerations early in the design process, and Integrated Design Systems (IDS), (b) develop methods in another effort to electronically capture digitized contractor design and technical information databases and use them for subsequent modification and reprourement of parts.

In FY89, it is planned to: (a) evaluate methods for digitized capture and use of technical information databases at an Air Logistics Center, and (b) design a reliability and maintainability trade-off analysis for mechanical systems in a joint-project with the Army.

In FY90, it is planned to: (a) improve computer-aided maintainability design by modeling the dynamics of a maintenance technician's limbs, (b) perform a limited field test of an integrated information modeling and management system at an Air Logistics Center, and (c) delay the IDS program due to an OSD directed budget reduction.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improved performance and maintainability trade-offs which should reduce costly redesigns and modifications, and increase supportability and operational readiness.

In FY88, specific accomplishments included: (a) transitioned software and a database which allows Air Force oversight of contractor weapon system trade-off studies to the Air Force Logistics Command (established as the Air Force standard), and to the Navy SSN-21 Seawolf program, (b) a computerized anthropometric model of a maintenance technician (transitioned to industry for evaluation as a maintainability design tool), (c) completed a preliminary, multi-laboratory demonstration of information transfer between developing components of Computer-Aided Acquisition and Logistics Support (CAALS), and (d) integrated CAD tools for reliability and maintainability trade-offs into the design process for the new Integrated Electronic Warfare System.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2950	INTEGRATED MAINTENANCE INFORMATION SYSTEM	\$ 6.0M	\$ 5.6M
PE: 63106F	LOGISTICS SYSTEMS TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

## PROJECT SYNOPSIS:

The objective of this Project is to develop a portable computer to display instructions and fault diagnosis to flight line technicians.

This computer will allow replacement of the paper-based Technical Order system with a digital system. It will link all technical order, diagnostic (including built-in weapon system tests), training, scheduling, control, management, and supply information required by maintenance technicians.

In FY89, it is planned to: (a) conduct initial field tests of portable maintenance aiding and diagnostic technology on the flight line using the F-16, (b) conduct a joint-test of diagnostics with the Navy using the F/A-18, (c) test the specification for generation, update, and presentation of pageless digital electronic technical orders, (d) initiate a program to interconnect stand-alone portable technician maintenance aids to the base maintenance and supply, (e) transition the draft specifications to weapons systems, and (f) perform work in maintenance diagnostics research and development as a result of a \$2.0M OSD-directed enhancement.

In FY90, it is planned to: (a) complete the joint-Service test with the Navy on the F/A-18, (b) continue development of joint-Service specifications for pageless technical data, (c) continue development of advanced display screens and components to enable flight line use, and (d) incorporate supply interface, reporting, and automated access to pilot debrief into a base-wide Integrated Maintenance Information System (IMIS) prototype.

## PAYOFF/UTILIZATION:

The payoff of this Project is a user-friendly, stand-alone portable computer display which is a complete system for maintenance fault diagnosis and automated maintenance instructions, that will: (a) permit replacement of the current inflexible paper-based Technical Order system with easy-to-use, interactive job guidance that is adjustable to the level of detail needed by each technician, (b) link all technical order, diagnostic (including built-in weapon system tests), training, scheduling, control, management, and supply information required by maintenance technicians, and (c) significantly increase the productivity of maintenance and support personnel and the resiliency of maintenance organizations in combat.

In FY88, specific accomplishments included: (a) a successful joint-Service (Air Force, Navy, and Marine) test of the intermediate shop computerized maintenance aid system, (b) development of interactive diagnostic techniques for integrating the technician's maintenance aid with an on-board test, (c) development of draft specifications for standardized development of digital databased maintenance instructions, and (d) completion of the initial digital pageless technical instruction authoring system for test and industrial evaluation.

## PROGRAM ELEMENT OVERVIEW

PE: 63227F PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY

CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES  
EDUCATION & TRAINING  
MANPOWER & PERSONNEL

DoD ORGANIZATION: AF

FUNDING: FY89 \$ 8.5M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 7.8M (FY90 PRESIDENT'S BUDGET)

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PE SYNOPSIS:

The objective of this Program Element is to increase the Air Force's readiness and effectiveness by providing cost-effective solutions to problems of training, personnel acquisition and job assignment, manpower management, and human performance in weapon systems.

Increased complexity of Air Force systems, rapidly changing technology, and decreasing manpower pools/authorizations, requires development of advanced technologies for personnel acquisition, job assignment, manpower management and training to ensure success in combat operations. Efforts in this Science and Technology program focus upon development, demonstration, and evaluation of: (a) flight simulator technology to enable realistic, small or large-scale, combat mission training, (b) cost-effective performance measurement technologies for aircrew and maintenance personnel, (c) technologies for job aiding, (d) performance-based training planning, evaluation, and needs identification technologies, and (e) proof-of-concept computer-based training, authoring and delivery systems.

This program is managed by three divisions of the Air Force Human Resources Laboratory: The Manpower and Personnel Division, Operations Training Division, and the Training Systems Division. Training Systems Division has an operating location at Bergstrom AFB in support of Project 2557.

## RELATED ACTIVITIES:

Related Program Elements: 0603231F, Crew Systems Technology; 0602205F, Personnel, Training, and Simulation; 0604227F, Flight Simulator Development; 0604243F, Manpower, Personnel, and Training Development.

Air Force efforts directed toward improvement of the Armed Services Vocational Aptitude Battery (ASVAB) and the production of new forms of that test are directed, in part, by a tri-Service steering committee of General Officers. Similarly, efforts concerned with the development of computerized testing techniques, for eventual implementation at Military Enlistment Processing Stations, are coordinated with the Army Research Institute (ARI), Navy Personnel Research and Development Center (NPRDC), and the Center for Naval Analysis. Air Force responsibilities lie principally in the development of test items suitable for computer implementation. Efforts across all Services to develop job performance measures are coordinated by a working group monitored by the Office of the Assistant Secretary of Defense for Force, Management and Personnel. Close coordination is maintained both at the working level and by laboratory management with ARI, NPRDC, the Army Program Manager for Training Devices (PM TRADE), and the Naval Training Systems Center (NTSC). Exchange of proposed statements of work for contractual efforts, wide dissemination of technical reports, and attendance at symposia and meetings ensure that work conducted within this Program Element benefits from, and does not duplicate, work conducted by the other Service laboratories. The Air Force Human Resources Laboratory closely monitors all significant research and development being conducted by other DoD, NASA, and industrial organizations in order to prevent duplication of effort. Close

coordination within the Air Force user community is also accomplished by annual research and development coordination meetings between the Laboratories, the Aeronautical Systems Division, and the Major Commands.

#### PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) improved aircraft simulation image generation and display systems, (b) improved tests for selecting, classifying, and assigning quality personnel to jobs, (c) improved technical training systems to increase the efficiency and productivity of personnel, and (d) improved estimations of manpower, personnel, and training requirements for improved weapon system design and support.

#### FUTURE DIRECTIONS:

In FY91, for the Advanced Visual Technology System Project, it is planned to: (a) determine the training effectiveness of the dome display, and (b) develop alternative designs for full field-of-view display systems to enhance the training capability and reduce acquisition and maintenance costs.

In FY91, for the Aircrew Combat Mission Enhancement (ACME) Project it is planned to: (a) complete enhancements for the fiber-optic helmet-mounted display visual system to improve image resolution, and (b) demonstrate a prototype two vs. many aircrew combat training systems.

In FY91, for the Personnel Assessment Systems Project, it is planned to: (a) develop computer adaptive occupational survey techniques, (b) develop and evaluate predictors of on-the-job performance as related to Air Force enlistment standards, and (c) develop guidelines and specifications for operational development of job performance measurement systems.

In FY91, for the Basic Job Skills Assessment and Enhancement Project, it is planned to: (a) perform the field evaluation of the Avionics Extended Job Family Trainer, and (b) develop a Mechanical Extended Job Family Trainer for eight to ten related specialties.

In FY91, for the Intelligent Computer-Assisted Training (ICAT) Project, it is planned to: (a) determine the hardware and software requirements for cost effective and "user friendly" ICAT development, and (b) determine which instructional strategies provide the best training in ICAT applications.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2363	ADVANCED VISUAL TECHNOLOGY SYSTEM	\$ 1.1M	\$ 0.4M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

## PROJECT SYNOPSIS:

The objective of this Project is to develop technology to advance the state-of-the-art in visual simulation technology and demonstrate the utility of this technology for critical Tactical Air Force (TAF) training requirements.

Current Air Force flight simulators, while providing excellent training for such things as emergency procedures, instrument navigation, and flying skills training, lack the fidelity to effectively train the more complex and demanding tactical combat tasks. This Project has three thrusts: (1) to develop, demonstrate, and evaluate advanced computer image generation (CIG) systems capable of producing highly detailed and complex combat scenes with multiple aircraft, enemy threat systems, realistic terrain, and special effects such as dust, smoke, and missile flight, (2) develop flight simulator visual display systems with sufficient resolution and brightness to fully display the CIG imagery, and (3) conduct behavioral experiments to determine the level of fidelity and complexity required in flight simulators to enable effective combat mission training for critical Tactical Air Force air-to-air and air-to-ground requirements.

A special emphasis of this project is to pursue technologies that reduce the cost of flight simulators, which currently cost upwards of \$10 million per unit. A major effort within this project is the development of a high resolution dome visual display system which can present detailed imagery over the entire field-of-view available in an F-16 cockpit. This effort, jointly funded by Program Element 0604227F, will incorporate current technology to track pilot head movements and present a small area of more detailed imagery directly where the pilot is looking. This system will provide both a research test-bed for fidelity requirements experiments and a proof of design system to satisfy the Tactical Air Force requirement for full field-of-view flight simulator visual displays.

In FY89, it is planned to build the prototype dome system at the contractor facility.

In FY90, it is planned to install the prototype system in the laboratory at Williams AFB.

## PAYOFF/UTILIZATION:

The payoffs of this Project include advanced visual display technologies and capabilities to meet the very demanding simulator training requirements of the TAF.

This Project previously contained work on the demonstration and evaluation of an eye-slaved, high-resolution image inset capability for the fiber-optic, helmet-mounted display (FOHMD), as well as refinements to make the FOHMD lighter and stronger. It also developed and evaluated an advanced

computer-image generation (CIG) system for the Advanced Simulator for Pilot Training (ASPT).

In FY88, specific accomplishments included: (a) completing upgrades to the R&D computer image generation system which enable simultaneous two-ship operation and significantly increased scene complexity and realism, (b) completing an experiment which mapped the field-of-view used by F-15 and F-16 pilots during offensive and defensive air-to-air combat maneuvers and validated the requirement for full field-of-view flight simulator displays for air-to-air combat training, (c) completing the design of a prototype full field-of-view dome visual display system, incorporating a head-tracked high resolution inset to provide greater scene detail where the pilot is looking, and (d) completing evaluation of simulator field-of-view requirements for C-130 low level navigation and air drops, which determined that reducing the field-of-view results in increased reliance on cockpit instruments and potential negative training, since performance of those tasks in the aircraft is primarily accomplished using out-the-window visual cues.



## PROJECT OVERVIEW

	89	90
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PROJECT: 2364	TRAINING AND PERFORMANCE \$ 1.0M	\$ 0.0M
	DATA CENTER	
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY	
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING	
DoD ORGANIZATION:	AF	
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY	

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PROJECT SYNOPSIS:

The objective of this Project is to provide the annual Air Force portion of the funding for the joint-Service, Defense Training and Performance Data Center (TPDC).

This project provides the annual Air Force portion of the Advanced technology development funding for the joint-Service, TPDC. TPDC, as the OSD focal point for training technology and management information, designs, analyzes, and integrates training databases for the entire DoD training community.

By the Office of the Secretary of Defence (OSD) direction, in FY90, this Project is transferred to the Defence Logistics Agency (DLA), Program Element 64722S.

## PAYOFF/UTILIZATION:

The payoff of this Project is improved collection and availability of training data in the Department of Defense training community.

In FY88, specific accomplishments included supporting the data collection and system maintenance efforts of the USAF's Advanced On-The-Job Training System (AOTS) R&D program (Project 2557).

## PROJECT OVERVIEW

		89	90
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PROJECT: 2557	ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)	\$ 1.3M	\$ 0.0M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objectives of this Project are to design, develop, implement and test a prototype state-of-the-art training system that integrates and effectively develops, manages, evaluates, and automates job-site training for the active Air Force.

Approximately 70 percent of Air Force technical training is accomplished by on-the-job training (OJT). More than 50 percent of all enlisted members of the Air Force are undergoing OJT at any one time. However, the system has not been significantly changed since its inception almost 40 years ago. Currently, OJT is labor-intensive, limited by excessive administrative burdens, and is not responsive enough to unique job-site training requirements.

The Advanced On-the-Job Training System (AOTS) will be implemented and demonstrated for four Air Force specialties at Bergstrom AFB, in cooperation with Tactical Air Command (TAC). This program complements other Air Force maintenance and logistics automation initiatives.

This Project was transferred from PE 63751F at the end of FY87.

In FY89, specifications for full scale development and fielding will be transitioned to Program Element 0604243F, Manpower, Personnel, and Training Development.

## PAYOFF/UTILIZATION:

The payoffs of this Project include increased on-the-job (OJT) effectiveness and training quality, thereby increasing individual and unit productivity and readiness in peacetime and combat capability in wartime.

In FY88, specific accomplishments included: (a) completing integration of the Advanced On-the-Job Training System subsystems, (b) determining the requirements associated with maintenance, reliability, logistics, and transition of the system, and (c) beginning the Operational Test and Evaluation (OT&E) of the prototype system during the fourth quarter.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2743	AIRCREW COMBAT MISSION ENHANCEMENT (ACME)	\$ 3.2M	\$ 3.8M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to advance tactical flight simulation by demonstrating and evaluating technologies for realistic tactical combat mission training, combat mission planning, and mission rehearsal.

A paramount objective of today's Tactical Air Forces is training for combat. Unfortunately, operational air combat training is severely constrained by a number of cost, safety, technical, and security restrictions. The impact of these restrictions is that training objectives involving combinations of multiple enemy and friendly aircraft, ground threats, electronic countermeasures, and variations in weather and terrain are difficult or impossible to accomplish in the aircraft. ACME will develop, demonstrate and evaluate an air combat situational awareness training system to enable affordable, effective, and realistic aircrew combat mission training. This system will consist of a local area network of high-, medium-, and low-fidelity flight simulators and operator control stations. The network will enable scenarios with up to 14 live participants, and have the capacity for long distance networking to other simulation facilities. Off-the-shelf hardware and research prototypes will be integrated, and new technologies will be developed to provide a dynamic environment for training the full spectrum of combat tasks. Key technologies to be developed include: (a) cost effective enemy threat systems simulations, (b) wide field-of-view, high-resolution visual displays, (c) low-cost adversary control stations, and (d) more capable instructor/mission control stations. Behavioral experiments will evaluate the fidelity requirements for individual components within the network, scenario complexity and realism requirements for effective training, the proper mix of high-, medium-, and low-fidelity/cost devices, and the training value of many-on-many versus single-, two-, or four-ship training. These demonstrations will help define simulator requirements to meet critical Tactical AF needs.

In FY89, it is planned to: (a) begin refinements to the Fiber-Optic Helmet-Mounted Display (FOHMD) to improve display resolution, (b) integrate two FOHMDs with the low-fidelity pilot/operator stations to create the initial training system, and (c) develop the multi-ship mission control system to enable effective control of simulator training exercises.

In FY90, it is planned to: (a) demonstrate the two-vs.-four aircrew combat training system, (b) begin fabrication of the multi-ship mission control system, and (c) begin development of more accurate and realistic threat and weapons simulations for training.

## PAYOFF/UTILIZATION:

The payoff of this Project involves the advancement of flight simulation concepts through the development of advanced training technologies for tactical aircraft, using multisensor, multicockpit combat mission simulators with advanced display capabilities.

This application of advanced simulator technologies at both training center and operational unit levels will lead to improved sustained aircrew readiness. It will significantly extend the range of training tasks that can be successfully accomplished in simulators.

In FY88, specific accomplishments included: (a) completing the development of an advanced fiber-optic helmet-mounted display with an expanded instantaneous field-of-view (FOV) of 160 by 80 degrees, to more closely match the aircraft FOV, (b) demonstrating a low-cost, single-ship and networked two-ship, beyond-visual-range, air-to-air tactics trainer, and (c) completing the experiment using 40 Tactical Air Command F-15 pilots and 20 ground control intercept controllers which established the value of interactive multi-ship, air-to-air simulator training.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2922	PERSONNEL ASSESSMENT SYSTEMS	\$ 0.7M	\$ 0.7M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to provide technology: (a) to enable the Air Force to meet its manpower needs for combat readiness and sustainability, and (b) for the development of systems to provide information on individual job performance and job requirements.

As mandated by Congress, cost-effective methodologies for task-level measurement of on-the-job performance will be developed and demonstrated to enable validation of enlistment selection and classification standards, and will relate those standards to job requirements. This Project will develop tools and methods to enhance the consideration of manpower, personnel, and training factors early in the system design and acquisition process.

In FY89, it is planned to: (a) examine the relationship between experience and performance at different levels of aptitude to determine if and when experience compensates for lower aptitude, and (b) determine the value added by job performance information over and above that provided by training information in selection and classification test validation studies.

In FY90, it is planned to: (a) begin development of automated procedures for matching comparable weapon system task data for use in the design of new weapon systems, (b) continue development and evaluation of low cost job performance measurement methodologies, (c) demonstrate the validity of man-hour savings for automated job knowledge test generation procedures, and (d) begin development of automated procedures for clustering tasks into efficient jobs or training modules.

## PAYOFF/UTILIZATION:

The payoff of this Project is technology to enable the Air Force to meet its manpower needs for combat readiness and sustainability and to measure individual job performance through: (a) replacement of test batteries, thus avoiding obsolescence and test compromise, and incorporation of improvements identified in ongoing service test research programs, (b) continuation of test revisions (e.g., ASVAB) and validation against performance measures, as mandated by Congress, and (c) development of measures for validation of enlisted selection and promotion tests to reduce the risk of civilian class-action suits against the government, resulting in potential cost avoidance of approximately \$2.5 Million per year.

In FY88, specific accomplishments included: (a) completing analyses and reporting results to Congress on job performance measurement data relating enlistment standards to job performance for seven Air Force specialties: Air Traffic Controller, Avionics/Communications Specialist, and Ground Radio Operator, Personnel, Life Support, Aerospace Ground Equipment, and Precision Measuring Equipment, and (b) completing initial procedures for generating specifications for promotion system job knowledge tests based on task-level data available in the occupational survey database.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2949	BASIC JOB SKILLS	\$ 0.8M	\$ 1.2M
	ASSESSMENT AND		
	ENHANCEMENT		
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The objective of this Project is to develop, demonstrate and evaluate systems to train basic job skills and thus bring the first-term airman to a functional level faster.

Modern high technology systems have relieved the human from performing many of the routine diagnostic and repair tasks that enabled the novice to gain knowledge of the systems, and thus have made it more difficult for first-term airmen to obtain the necessary job experiences for growth from novice to expert. Related exploratory development efforts in Program Element 062205F have identified underlying, higher-order job skills, which distinguish between the expert and the novice. Research also indicates that many of these skills are common between "experts" on different but related system (e.g., avionics systems). These are skills that are not normally taught in technical schools but rather are gained through job experience.

This Project was transferred from Program Element 63704F at the end of FY87.

In FY89, it is planned to: (a) field-test the Avionics Job Family Trainer to determine if common expert skills across three Air Force F-15 avionics specialties can be taught, and (b) develop a Mechanical Job Family Trainer for F-15 jet engine mechanics, hydraulics specialists, and crew chiefs.

In FY90, it is planned to: (a) complete the evaluation of the Avionics Job Family Trainer, (b) perform the field evaluation of the Mechanical Job Family Trainer, and (c) develop an Avionics Extended Job Family Trainer for eight to ten related F-15, F-16, and F-111 avionics specialties.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) a reduction in the number of marginal performers, and (b) reduction in overall on-the-job training time.

Air Force decision makers will be provided with scientifically valid, job-oriented, measurement and training, to ensure that airmen possess the basic job knowledge and skills needed to perform and progress satisfactorily during the first term of enlistment.

The original Comprehensive Occupational Data Analysis Program (CODAP) system has resulted in an estimated cost avoidance of over \$3 million per year since its implementation in FY68. Benefits of the updated CODAP include: (a) state-of-the-art analytical, statistical, and reporting procedures, (b) techniques for longitudinal analyses of job content, (c) techniques for developing more job-related enlisted promotion tests, and (d) techniques for matching weapon system acquisition tasks with related personnel skill requirements.

In FY88, specific accomplishments included completing the field test of the Avionics Troubleshooting Tutor for the F-15 off-equipment avionics manual test station, resulting in significant improvement in troubleshooting skills for airmen trained with the tutor, as compared to airmen receiving standard training, and demonstrating that common expert skills for one Air Force job specialty can be taught.

## PROJECT OVERVIEW

		89	90
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PROJECT: 3057	INTELLIGENT COMPUTER-ASSISTED TRAINING (ICAT)	\$ 0.5M	\$ 1.7M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

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PROJECT SYNOPSIS:

The object of this Project, is to develop and demonstrate software to enable the Air Force training developers to rapidly and inexpensively build Intelligent Computer-Assisted Training (ICAT) systems without the need for computer programming specialists.

ICAT systems act like a human tutor, continually evaluating and interacting with the student to deliver more individualized and effective training. This Project will also develop guidelines and specifications for the most effective instructional strategies and applications for ICAT.

In FY89, it is planned to: (a) begin software design and development of a rapid prototyping testbed for ICAT systems, and (b) develop designs to allow for adaptation of training delivery for differences in student ability.

In FY90, it is planned to: (a) demonstrate an ICAT rapid prototyping capability for evaluating ICAT designs and applications, (b) evaluate the utility of incorporating high fidelity equipment or system simulations within ICAT systems, and (c) begin development of ICAT demonstrations to determine the most appropriate career fields for application of ICAT technology.

## PAYOFF/UTILIZATION:

The payoff of this Project is the reduction of the training workload, an increase in the effectiveness of instructional simulations, and an increase in training performance, without the need for increased manpower for training.

When completed, this program will provide field demonstrations of intelligent computer-assisted training applications and guidelines for expanded use. This moderately high-risk, five-year program is designed to capitalize on the advances in intelligent computer-aided instruction and personal computer engineering. It will focus on cost effective, efficient delivery of training.

In FY88, specific accomplishments included completing a comprehensive review and evaluation of state-of-the-art ICAT technology and the computer hardware required for training development and delivery.



## PROGRAM ELEMENT OVERVIEW

PE: 63231F                      CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY  
 CONGRESSIONAL CATEGORY:      HUMAN FACTORS  
 DoD ORGANIZATION:            AF  
 FUNDING:                      FY89 \$ 6.5M (FY90 PRESIDENT'S BUDGET)  
                                  FY90 \$ 6.6M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to provide advanced development and demonstration of concepts to protect and extend the performance of the crew member in the hazardous aerospace environment.

The program applies primarily to aircrews, but some applications extend to groundcrews conducting flightline operations. Specific projects include human factors considerations in the design of cockpits that significantly improve situational awareness, and that also improve the protective features of air and groundcrew life support equipment. A new start in 1991 will develop man-machine interfaces for remote control of robotic systems doing hazardous Air Force tasks, such as flight line work during chemical attack. All demonstrated concepts in this Program Element will feed into full-scale development programs to address fifteen documented needs from USAF commands which require specific warfighting capabilities.

The in-house developing organization responsible for this program is the Human Systems Division, Deputy Commander, Development and Acquisition, with the assistance from its laboratories, the United States Air Force School of Aerospace Medicine, the Air Force Human Resources Laboratory and the Armstrong Aerospace Medical Research Laboratory; and through memoranda of agreement with other laboratories, divisions and commands, Services and agencies.

## RELATED ACTIVITIES:

All projects use applicable technologies from Program Element #0602202F, Human Systems Technology. Program Element #0603205F, Aerospace Vehicle Technology, provides matrixed manning for development of pilot/vehicle interface technologies and simulation capabilities. Program Element #0603745F, Chemical Warfare Defense, funded Project 2722, Biomedical Chemical Warfare Defense, in FY87 before being rolled into Program Element #0603231F. Successfully demonstrated concepts from this program that meet Air Force needs are transitioned to Program Elements #0604706F, Life Support System, and #0604703F, Aeromedical/Chemical Defense Systems.

There is no unnecessary duplication of effort within the Air Force or the Department of Defense. Products are provided to Aeronautical Systems Division (ASD), Human Systems Division (HSD), Electronic Systems Division, Space Division, and others via technology transition agreements.

Life Support activities are included in ASD's Ten Year Life Support Master Development Plan and are coordinated through the Tri-Service Life Support Equipment RDT&E Steering Group reporting to the Joint Logistics Commanders. Military space crew activities are coordinated with other Services or agencies and with the National Aeronautics and Space Administration through joint participation in the Air Force Scientific Advisory Board and the Space Technology Interdependency Group. Laser protection technology is coordinated through the Tri-Service Laser Hardened Materials and Structures Group, chaired by the Office of the Under Secretary of Defense for Research and Engineering. Man-machine integration activities were coordinated through a

Tri-Service Initiative Panel chartered by the Joint Directors of Laboratories and chaired by the Cockpit Automation Technology (Project 2829) Office and the ASD/HSD Crew Station Working Group. Coordination for Project 2829 also occurs through a Crew Station Working Group within the Air Force Systems Command and through a joint Aeronautical Commanders' Group Committee. Robotics activities are coordinated with the Department of Energy and with the other Services through the Joint Technology Panel for Robotics reporting to the Joint Directors of Laboratories. The Army is the Department of Defense lead agency for chemical warfare defense, and only efforts that have specific Air Force relevance, or that can be accomplished more economically using Air Force expertise, are accomplished in Project 2722, Biomedical Chemical Warfare Defense. Areas with multiservice application are identified in the joint Services Research, Development and Acquisition Plan for Chemical Warfare for inclusion in the Army's overall research program. Medical chemical defense efforts are further coordinated through the Armed Services Biomedical Research, Engineering and Management Committee.

#### PAYOFF/UTILIZATION:

The payoffs of this Program Element include advances in crew systems technology which will increase aircrew performance and protection in the hazardous aerospace environment.

Maximizing the decision-making ability and performance of, and sustaining and protecting, pilots and aircrews is vital for maintaining a combat-effective aeronautical force. The inability of the system operator to sufficiently perceive, decide, and act upon information, and many other mental and physical demands, may diminish aircrew performance, endanger aircrew safety, or decrease survivability. These limit, or preclude the successful use of, a pilot's tactical skills in combat situations and, ultimately, the potential for combat mission success. Work under this Program Element will result in the reduction or elimination of such threats and limits.

#### FUTURE DIRECTIONS:

In FY91, for the Cockpit Automation Technology (CAT) Project, it is planned to: (a) ground test the performance and workload evaluation system, and (b) apply mission analysis to a national strategic crew system.

In FY91, for the Space Crew Enhancement (SPACE) Project, it is planned to identify crew station design criteria and advanced technologies for manned military space systems.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2829	COCKPIT AUTOMATION TECHNOLOGY (CAT)	\$ 5.5M	\$ 5.6M
PE: 63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AEROSPACE MEDICAL DIVISION		

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PROJECT SYNOPSIS:

The objective of this Project is to develop a crew system design method that applies structured systems engineering and human factors principles early in the development cycle of manned aerospace vehicles.

With this approach, predicted pilot performance and mission success with new automation concepts are measured using the contractor's simulators to find the best cockpit design. When implemented in industry, costly, last minute, cockpit redesigns can be reduced or avoided altogether.

In FY89, it is planned to: (a) apply CAT's computer-aided engineering/analysis system, and (b) begin ground simulations of the upgraded baseline cockpit to compare the benefits of aiding pilot tasks with automation.

In FY90, it is planned to: (a) test the rapid-prototyping, real-time, laboratory simulator for its effectiveness in crew system evaluation, and (b) develop software for in-flight analysis of pilot performance and workload.

## PAYOFF/UTILIZATION:

The payoffs of this Project include the publication and distribution of military standards, design handbooks, and extensive computer-assisted procedures to the military services, National Aeronautics and Space Administration (NASA), and contractors, for use early in the design process to determine the cost-effective design of aircrew training needs.

The early application of this crew system design process will reduce system program costs and risks associated with engineering change proposals and retrofits stemming from the limited design insight available from currently used techniques. For the first time, a coordinated weapon system design process which permits trade-offs between airframe, avionics, and cockpit design will be possible in advance of Full-Scale Development (FSD) decisions. It will also provide insight into the adequacy of the design after potential downstream avionics and weaponry modifications.

In FY88, specific accomplishments included: (a) completing development of the crew system design process, and (b) completing the specification of the F-15E baseline cockpit, and an experimental upgraded cockpit for CAT demonstration.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2992	SPACE CREW ENHANCEMENT (SPACE)	\$ 1.0M	\$ 1.0M
PE: 63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY		
CONGRESSIONAL CATEGORY:	HUMAN FACTORS		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AEROSPACE MEDICAL DIVISION		

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PROJECT SYNOPSIS:

This Project develops specialized crew protection systems and man-machine integration needed to support possible military missions from space.

Efforts will improve crew performance and protection in environments unique to military space systems. Near-term efforts support the Air Force Space Command's Military-Man-in-Space program. This support involves measuring a human's visual ability in identifying military ground targets from space. Experiments onboard the space shuttle are being conducted to collect the visual performance data.

This Project was transferred from Program Element 63365F (Space Biotechnology) to Program Element 63231F (Crew Systems Technology) in FY86.

In FY89, it is planned to perform ground tests of the space telescope to check performance.

In FY90, it is planned to integrate the telescope for a shuttle flight test via the Space Test Program and Military Man-In-Space Program.

## PAYOFF/UTILIZATION:

The payoffs of this Project include to: (a) a define of man's potential roles in military space systems, including his ability to successfully perform projected military missions, (b) analyze the trade-offs of manned versus unmanned space systems, (c) develop technologies, in the near term, to support and enhance crew effectiveness in the development of transatmospheric vehicles with potential different launch and egress response times, flight durations, acceleration profiles, performance characteristics, and operator workload and task requirements than the space shuttle, and (d) design effective future systems, optimally utilizing man's abilities, and of subsystems to protect man and further extend the system's capabilities in the long term.

In FY88, specific accomplishments included: (a) testing the 5 PSI pressure suit with new joints and showing improved comfort and mobility, and (b) fabricating a telescope for a space shuttle test (#2 priority experiment in the DoD Man-In-Space Program) that will measure the human capability to observe and track ground targets.

## PROGRAM ELEMENT OVERVIEW

PE: 64227F                      FLIGHT SIMULATOR DEVELOPMENT

CONGRESSIONAL CATEGORY:      SIMULATION & TRAINING DEVICES  
EDUCATION & TRAINING

DoD ORGANIZATION:            AF

FUNDING:                      FY89 \$ 63.1M (FY90 PRESIDENT'S BUDGET)  
FY90 \$ 65.2M (FY90 PRESIDENT'S BUDGET)

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PE SYNOPSIS:

The objective of this Program Element is to provide for engineering development of aircrew flight simulator techniques and training devices.

This Program Element funds efforts to: (a) adapt flight simulation technology developed in the laboratories and industry for satisfying current training requirements, and (b) develop prototype training devices. Prototype training devices and subsystems developed under this Program Element will be evaluated for training effectiveness and supportability prior to follow-on production decisions and/or acquisition.

This Program Element relies heavily on the Air Force Human Resources Laboratory science and technology programs, including PE 62205F, Training and Simulation Technology, PE 63277F, Advanced Simulator Development, and PE 63751F, Innovations in Education and Training.

*The in-house developing organization responsible for this program is the Deputy for Training Systems.*

## RELATED ACTIVITIES:

There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

For the Standard DoD Simulator Database/Common Transformation Program, related activities include: (a) Defense Mapping Agency (DMA) Exploitation Modernization Program, (b) Rome Air Development Center (RADC) Cartographic Applications for Tactical and Strategic Systems (CATSS) Program (Program Element 0603227F), (c) U.S. Army Program Manager for Training Devices (PM TRADE) Rapidly Reconfigurable Database (RRDB) Program, and (d) Joint Technical Coordinating Group for Training Systems and Devices (JTOG-TSD): established by the Joint Logistics Commanders, and members include acquisition and support executives from all Services. This Project (Project 2851) is sponsored and approved by the JTOG-TSD. Project status is briefed to them quarterly.

Project 2968, the Modular Simulator Design Project, is a joint-Service Project conducted under the Joint Logistic Commanders (JLC) through the Joint Technical Coordinating Group for Training Systems and Devices.

For Project 3143, the Advanced Tactical Fighter (ATF) Project, the updated Program Management Directive (PMD) for the ATF includes a direction to plan for meeting Navy pilot and maintenance training needs. To accomplish this task, the appropriate Navy training elements will participate in the Training Planning Team meetings to address Navy requirements. Details of the actual implementation plan must still be worked with the Navy program office.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) lower costs of training and greater training safety, efficiency, and effectiveness through adaptation of flight simulation technology to today's complex aircraft, (b) improved supportability and effectiveness of flight simulators in the field, (c) improved training for Weapon System Operators, (d) reduced costs and improved deliverability of simulators through simulator modularity design and development of a Standard DoD simulator database that uses Defense Mapping Agency data for displays for aircrew training, (e) improved reliability and maintainability of both existing and planned flight simulators, (f) elimination of training deficiencies through provision of the Advanced Training System, and (g) improved support for operations personnel assigned to the Advanced Tactical Fighter (ATF) through the development of the ATF training system.

## FUTURE DIRECTIONS:

In FY91, for the Simulator Development Activities Project, it is planned to: (a) determine the limited excursion platform utility and drive laws for simulators, (b) complete development of the next generation motion/force cueing module, (c) complete the full field of view dome training effectiveness research tool development, and (d) complete the second generation low-cost, lightweight, helmet-coupled, image generation and projection device.

In FY91, for the Simulator Update Development Project, it is planned to continue development of the air-to-air simulator to lead-in fighter training.

In FY91, for the Standard DoD Simulator Data Base/Common Transformation Project, it is planned to test and accept turnkey production capability in May 91.

In FY91, for the Modular Simulator Design Project, it is planned to complete the validation on the test bed simulator.

In FY91, for the KC-135 Operational Flight Trainer Project, it is planned to complete delivery of the production units.

In FY91, for the Manpower, Personnel and Training (MPT) Project, it is planned to: (a) instruct an MPT Education Course, (B) evaluate MPT models development, (c) continue development of the MPT Computer Supported Network Analysis System (CSNAS) prototype, and (d) develop an MPT specialty structuring system.

In FY91, for the Advanced Training System (ATS) Project, it is planned to: (a) complete the coding and unit test of the first computer software configuration item (CSCI) in Jun 91, (b) perform the design, test and evaluation in Jun 91, and (c) begin the Initial Operational Test and Evaluation (IOT&E) at Kessler Technical Training Center (KTTC).

In FY91, for the Advanced Tactical Fighter (ATF) Project, it is planned to: (a) perform full-scale development (FSD) source selection, and (b) award the FSD contract.

In FY91, for the C-17 Aircrew Training System (ATS) Project, it is planned to: (a) deliver a set of training devices to the first operational site and begin training, and (b) continue fabrication of training devices for successive ATS sites.

In FY91, for the C-141 Aircrew Training System (ATS) Project, it is planned to begin course readiness reviews.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2325	SIMULATOR DEVELOPMENT ACTIVITIES	\$ 2.0M	\$ 3.1M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objectives, of this Project are to provide for the engineering development of training systems technology techniques, and preproduction, or first article training devices to satisfy current training requirements. It also: (a) addresses identified deficiencies in training capabilities, (b) improves concurrency between aircraft and flight simulators, and (c) reduces life cycle costs.

Work tasks within this Project are based on Category II through IV cost estimates. It complies with Office of the Secretary of Defense guidelines as follows: (a) provides data that will be used as generic building blocks in the development of new training devices, (b) develops sensor simulation for generic infrared and visual systems, and (c) is the only Project that addresses these requirements and test and specification development, with an extensive framework developed for front-end analysis. The emphasis is on generic development for use on all simulator programs to reduce acquisition and life-cycle costs, reduce acquisition time, and improve reliability, maintainability, and availability.

In FY89, it is planned to: (a) assess current embedded training opportunities for a total tactical mission, (b) survey state-of-the-art technology alternatives for a low-cost tactical simulator, (c) evaluate computer-based instructional techniques for application in aircrew training devices, (d) determine G-seat drive algorithms for providing more effective flight motion in the simulator, and (e) determine maximum tolerable simulator induced time delays.

In FY90, it is planned to: (a) develop a generic software system to support the instructor operator station features, (b) develop a generic instructor operator station design capable of handling interfaces with multiple student stations, and (c) develop a process standard to complement the data item for assuring adequate aircraft data for simulators.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) lower costs and improved training effectiveness through the adaptation of flight simulation technology to today's complex aircraft, and (b) the flexibility to address generic technical problems to a wide range of simulator requirements and acquisition programs (i.e., database development, instructional systems, sensor simulation development, visual simulation development, handling qualities/training effectiveness, support, and configuration management).

In FY88, specific accomplishments included: (a) developing and evaluating low-cost helmet-mounted, visual display systems, (b) evaluating the utility of motion cueing and impact of simulator delays on training effectiveness, (c) analyzing threat data requirements for training systems, (d) establishing a standardized data item description to identify needed aircraft data for

simulators, (e) developing a generic modular software system for the instructor operator system, and (f) developing a transportable system test methodology for the Digital Radar Land Mass System (DRLMS) image generator.



## PROJECT OVERVIEW

		89	90
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PROJECT: 2769	SIMULATOR UPDATE DEVELOPMENT	\$ 5.4M	\$ 2.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to update training systems to maintain and improve their supportability and effectiveness.

As flight simulator systems age and technology changes, these systems become increasing costly and difficult to support, typically due to non-availability of analog and first generation digital spare parts. Updates to these systems include: (a) development of a C-130 Aircrew Training System (ATS), and (b) an air-to-air simulator to lead-in fighter training.

In FY89, it is planned to complete the C-130 ATS course readiness reviews.

In FY90, it is planned to: (a) conduct a C-130 ATS operative evaluation, (b) perform a C-130 ATS readiness review in Aug 90, (c) transfer C-130 ATS program management responsibility in Aug 90, (d) perform C-130 ATS options for operation, management and support through FY99, and (e) develop the air-to-air simulator to lead-in fighter training.

## PAYOFF/UTILIZATION:

The payoffs of this Project include improved supportability and effectiveness of light simulators in the field.

In FY88, specific accomplishments included: (a) completing the C-130 ATS preliminary design review for modifications in Jan 88, and (b) conducting and completing the C-130 ATS Self Contained Navigation System (SCNS/Radios) critical design review.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2851	STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM	\$ 3.1M	\$ 2.3M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this joint-development Project, initiated through the Joint Logistics Commanders, is to develop a standard DoD digital database that uses Defense Mapping Agency (DMA) data displays for aircrew training (e.g., visual, radar, infrared).

This transformed database will be provided as government-furnished equipment (GFE) to simulator manufacturers, eliminating the cost associated with the current approach of developing a unique system for each simulator program that requires sensor simulation.

This Project complies with OSD guidelines by developing standard database and transformation programs for the application of generic sensor simulation on all training devices to reduce acquisition and life-cycle costs.

In FY89, it is planned to: (a) produce a prototype database, and (b) complete the test readiness review.

In FY90, it is planned to: (a) perform acceptance testing of the development system in Nov 89, (b) perform the interim production and exercise validation option in Nov 89, and (c) procure turnkey production capability in May 90.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) elimination of problems and expenses associated with the proliferation of unique transformation programs and periodic updates (due to specification and requirements changes) by developing a Defense Mapping Agency (DMA) database for transformation programs, (b) assistance in achieving transportability (e.g., transportable databases between trainers), and (c) reduced costs for future systems.

In FY88, specific accomplishments included: (a) establishing an Industry/Service Working Group, (b) completing the preliminary design review, and (c) completing the critical design review.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2901	B-1B WEAPON SYSTEM TRAINER (WST)	\$ 6.5M	\$ 5.5M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to develop an aircrew training device for all B-1B crew members to include mission rehearsal for takeoff and landing, navigation, air refueling, threat analysis/countermeasures, low-level penetration, weapons delivery, and emergency procedures.

In FY89, it is planned to: (a) complete DT&E of the Support Center System for the Weapon System Trainer (WST) and the Mission Trainer (MT), (b) accept WST #1,2,3,4,5 and MT #2, and (c) complete design on Block 3.5/4.5 software updates.

In FY90, it is planned to: (a) complete the system verification test on Block 3.5/4.5 updates for WST, MT and the Cockpit Procedure Trainer (CPT), (b) deliver the updates for aerodynamics on the operational flight trainer and WST, and (c) deliver Block 3.5/4.5 updates for WST, MT and CPT.

## PAYOFF/UTILIZATION:

The payoff of this Project includes the development of a training system to meet the training needs of all B-1B crew members. The training system will emphasize integrated crew training and training tasks that cannot be accomplished in an aircraft, such as flight safety, emergency procedures, and emergency war rehearsal.

In FY88, specific accomplishments included: (a) completing the independent mode system verification test, (b) completing acceptance tests on six CPTs, and (c) awarding the contract for Block 3.5 and 4.5 software updates to WSTs and Block 3.5 update to CPTs.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2968	MODULAR SIMULATOR DESIGN	\$ 1.9M	\$ 0.3M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to assess, develop, and implement a modular systems design approach to the development of simulators.

A strong requirement exists to use a modular systems design approach to: (a) reduce simulator life-cycle cost, (b) reduce development lead time, (c) improve the Air Force's ability to deliver simulators to the field concurrently with the aircraft (and to keep the configuration current with the system in the field, and to update simulators as new and different sensors are needed for training), and (d) increase the competitive contractor base.

This Joint Logistics Commanders (JLC)-sponsored program consists of three phases and is an attempt to make the pieces of a training device as interchangeable between systems as possible. Phase I was a Request for Information (RFI) from the simulator industry to assess, from an industry perspective, the feasibility of modular simulators, e.g., the advantages, disadvantages, cost, and potential impact on technology. Phase II was a competitive effort between two contractors to identify the tools needed to implement modularity, and to develop a suggested specification, statement of work, and implementing strategy. Analysis of these phases will lead to Phase III, development and validation, on an existing device, of the standards and tools necessary to achieve a modular simulator.

This Project complies with OSD guidelines by reducing acquisition and life-cycle costs by development of standard interfaces between simulator pieces using best commercial practices.

In FY89, it is planned to: (a) conduct the Critical Design Review (CDR) - Part I, (b) complete Phase III - Part I with publication of a draft military standard for modular simulators, (c) obtain the Secretary of the Air Force decision to enter Phase III - Part II, and (d) develop modular software (modules).

In FY90, it is planned to: (a) demonstrate the modular simulator architecture concept and validate it on the test bed simulator, and (b) publish the modular standard and incorporate it in the test bed simulator and future acquisitions.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) reduced simulator life-cycle cost, (b) reduced development lead time, (c) improved ability to deliver simulators to the field concurrently with the aircraft, and (d) an increased competitive contractor base, through a modular systems design approach to simulators.

In FY88, specific accomplishments included: (a) fabricating the Modular Validation test bed, (b) establishing Functional Baseline Requirements, (c) performing the Preliminary Design Review (PDR) - Part I in Mar 88, and (d)

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defining the interfaces.

## PROJECT OVERVIEW

	89	90
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PROJECT: 2997	GBU-15 PART TASK TRAINER \$ 0.5M	\$ 0.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT	
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES	
DoD ORGANIZATION:	AF	
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS	

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PROJECT SYNOPSIS:

The objective of this Project is to develop the GBU-15 Part-Task Trainer, a low-cost, ground-based device for training F-4E and F-111F Weapon System Operators (WSOs) to use the GBU-15 Precision Guided Munition (PGM).

Many of the primary skills required by aircrews cannot be routinely practiced in the aircraft due to operational constraints, signal radiation restrictions, and the high cost of training with live PGMs. The current Tactical Air Forces (TAF) simulators cannot train operators on the electro-optical/infrared mission specifics, and the costs to integrate this capability into the existing devices are prohibitive. The GBU-15 Part Task Trainer (PTT) will provide training in target acquisition and recognition, and in operation and guidance of target impact, and it will give WSOs the chance for hands-on systems operation during initial qualification training. It will also help maintain skill levels of qualified aircrews while saving valuable sorties and munitions resources.

A total of four (one development and three production) GBU-15 PTTs will be procured. Each will consist of a student station for the WSO, a limited instructor station, computational system, and an image generation system to provide the simulated video, visual environment effects, and required gaming area.

This effort will be completed in FY89.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved training for F-4E, F-15E, and F-111F Weapon System Operators in the employment of GBU-15 Precision Guided Munition, (b) improved maintenance of skill levels of qualified aircrews, and (c) increased savings of sorties and munitions resources.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2998	LOW ALTITUDE NAVIGATION AND TARGETING INFRARED SYSTEM FOR NIGHT (LANTIRN) SIMULATOR	\$ 7.3M	\$ 0.6M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to develop a LANTIRN simulator which, when integrated with an Operational Flight Trainer (OFT), provides the capability to fully train pilots in high-threat, night, adverse weather, heavily-task-loaded, environment-simulating combat.

Tactical Air Command (TAC) needs a safe, efficient means of training the LANTIRN mission in the high-threat, adverse weather, heavily task loaded environment-simulating combat. The complexity and inherent danger of operating the LANTIRN system requires part-task trainers (Project 2999, LANTIRN Part Task Trainer) for initial switchology training and F-16 and A-10 Operational Flight Trainers (OFTs) with LANTIRN simulation capability for full mission training.

The "core" LANTIRN simulator will include a computer image generation (CIG) system for the navigation pod and a higher resolution simulation capability for target recognition and weapons delivery tasks. An F-15E, F-16, and A-10 configured Part Task Trainer will be developed for switchology, modology, and symbology training at the combat crew training squadron.

In FY89, it is planned to: (a) integrate hardware and software, (b) perform contractor in-plant tests and Air Force development tests, (c) integrate the simulator with the F-16 OFT, and (d) test reliability and readiness for training.

In FY90, it is planned to complete manufacture, delivery, and the acceptance test.

This Project will be completed in FY90.

## PAYOFF/UTILIZATION:

The payoff of this Project includes safe, efficient training for aircrews to accomplish the LANTIRN mission in the high-threat, realtime, heavily-loaded task environment that is encountered when employing the LANTIRN system.

In FY88, specific accomplishments included: (a) completing the Critical Design Review in Dec 87, (b) exercising options to purchase four production F-16 LANTIRN simulators, (c) beginning avionics hardware/software integration, and (d) beginning fabrication of the subsystems.

## PROJECT OVERVIEW

		89	90
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PROJECT: 2999	LANTIRN PART TASK TRAINER	\$ 0.3M	\$ 0.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to develop LANTIRN Part-Task Trainers to effectively train pilots in LANTIRN (F-16, F-15E) switchology, modes of operation, symbology and F-15E avionics.

The complexity of the LANTIRN system and inherent danger of operating close to the ground, in the night, and in adverse weather, requires initial training that enhances safety and speeds understanding of the system operation. LANTIRN Part-Task Trainers (PPTs) will effectively train pilots in LANTIRN (F-16, F-15E) in switchology, modes of operation and F-15E avionics. These training devices will provide (a) an accurate representation of the aircraft cockpit, including all functional controls and switch responses, and (b) aircrews with familiarization training that will provide the lead in training for the more complex and dynamic LANTIRN simulation (Project 2998).

This effort will be completed in FY89.

## PAYOFF/UTILIZATION:

The payoff of this Project includes safe, efficient training for aircrews to accomplish the LANTIRN mission in the high-threat, realtime, heavily-loaded task environment that is encountered when employing the LANTIRN system.



## PROJECT OVERVIEW

		89	90
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PROJECT: 3000	KC-135 OPERATIONAL FLIGHT TRAINER	\$ 0.1M	\$ 0.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to refurbish and update the outdated MB-26 procedures trainers to train the Strategic Air Command (SAC) KC-135 crews.

The devices are expensive to maintain, almost always out of commission, and are unrealistic. In July 1981, the Aircraft Safety and Operations Review Board, after investigating several KC-135 accidents, highlighted the need for new simulators, particularly for engine-out and emergency procedures training.

The KC-135 Operational Flight Trainer (OFT) will simulate the pilot and co-pilot stations, and incorporate an on-board instructor's station, and a computer image-generated visual system for takeoff/landing and engine-out training. The OFT will also accurately simulate the total aircraft flight envelope and will meet SAC requirements for annual instrument evaluations. A total of 18 trainers will be optioned for upgrade to the KC-135 OFT configuration (approximately eight in the KC-135A configuration, and ten in the KC-135R).

This effort will be completed in FY89.

## PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved training for KC-135 crews, particularly addressing engine-out and emergency procedures training, (b) more realistic training through replacement of devices presently used that do not fully represent current aircraft configuration, and (c) cost savings, resulting from replacement of outdated analog technology that is expensive to maintain and achieves very low availability rates.

In FY88, specific accomplishments included: (a) completing the hardware/software integration, (b) completing contractor verification testing, and (c) commencing the government in-plant developmental test and evaluation, and the initial operational test and evaluation.

## PROJECT OVERVIEW

		89	90
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PROJECT: 3105	F-15E WEAPON SYSTEM TRAINER (WST)	\$ 0.1M	\$ 0.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	SIMULATION & TRAINING DEVICES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to develop the F-15E Weapon System Trainer (WST) to train both pilot and weapon system officers.

The Tactical Air Force's (TAF) requirement for a fighter that can conduct interdiction bombing as well as air-to-air missions must be supported by an aircrew training system that is capable of training all mission aspects. The F-15E WST will train both pilot and weapon system officers, and will include Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) simulation. The trainers will be a modification to the F-15 Operational Flight Trainer, being manufactured by Goodyear Aerospace Corporation. Six WSTs will be procured.

This effort will be completed in FY89.

## PAYOFF/UTILIZATION:

The payoff for this Project includes improved training of all mission aspects (including interdiction bombing and air-to-air missions) for Tactical Air Force F-15 pilots and weapon system officers.

## PROJECT OVERVIEW

		89	90
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PROJECT: 3135	ADVANCED TRAINING SYSTEM (ATS)	\$ 2.6M	\$10.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to provide a computer-based training system, the Advanced Training System (ATS), to alleviate various training deficiencies.

Changes to the Air Force training environment have resulted in increased training workload at the Air Training Command (ATC) Technical Training Centers. Increasing equipment complexity, together with greater student instructional needs, combine to heavily tax ATC's instructor resources. With increased emphasis on sortie generating skills and the need to train on more complex material in the electronic and mechanical fields, ATC has been increasingly unable to conduct remedial or individual instruction. In view of today's current efficiencies in automated support, computer-based instruction and computer-based management, the manual ATC system is becoming increasingly inefficient and inflexible. Without this system, a proliferation of discrete systems will continue to be acquired that are more costly and less efficient than the ATS. ATS will support all four major functions in the Technical Training arena: instructional development, delivery, evaluation, and management. Its main goals are to: (a) free instructors for remedial instruction in complex, highly technical tasks, (b) promote efficient training methods, and (c) provide rapid course creation and updating.

The ATS program responds to the Defense Science Board 1982 Summer Study on Technical Training which recommended improvements to our training approach. The ATS is a four-phased program to provide a computer-based training support system to alleviate this deficiency. It will be designed for hardware independence and will use Ada language for development.

In FY89, it is planned to: (a) begin Phase III- Full Scale Development (FSD) in Mar 89, (b) design and develop software and identify the hardware suite, and (c) perform the Software Specification Review in Jul 89.

In FY90, it is planned to: (a) continue Phase III FSD with the preliminary and critical design reviews (PDR and CDR, respectively) of the hardware and software suites; the PDR is scheduled during the second quarter and the CDR is scheduled during the fourth quarter, and (b) begin software coding.

## PAYOFF/UTILIZATION:

The payoffs for this Project include: (a) a remedial training capability, (b) more effective instruction, (c) decreased training time, (d) more effective use of instructors, (e) earlier detection of problems, (f) reduced student washbacks and eliminations, (g) cost savings, and (h) flexibility under surge.

In FY88, specific accomplishments included: a) completing the Front-End Analysis in Feb 88, (b) awarding the Phase II contract developing the System Specification in Dec 87, and (c) performing the system design review in Sep 88.

## PROJECT OVERVIEW

		89	90
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PROJECT: 3143	ADVANCED TACTICAL FIGHTER (ATF)	\$ 1.9M	\$ 0.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is to develop the Advanced Tactical Fighter (ATF) Training System to meet Manpower, Personnel and Training (MPT) needs to support operations personnel assigned to the weapon system.

The required training tasks include initial, continuation, upgrade, on-the-job training, and mission qualification levels which emphasize new job requirements. The Front-End Analysis (FEA) process will define all training requirements and integrate these findings into an ATF Total Training System. The defined training system will account for all operational, maintenance, and support personnel required by the weapon system, and will integrate all MPT aspects of each job description and skill level to ensure full mission support.

The FEA is broken down into two activities. In Step 1, the prime weapon system contractors were required to accomplish an FEA concurrently with their weapon system design task. This process results in a description of a total training system to include impact of new technologies, as well as a definition and a functional description of all system elements. Step 2 will require an independent FEA specialist to integrate all of the individual contractor data, analyze the user training requirements, and present to the Air Force recommendations and alternatives for implementing, supporting, and operating the total system.

The ATF weapon system is in the demonstration/validation phase; the Front-End Analysis (FEA) process will define a total ATF training system.

In FY89, it is planned to: (a) complete the FEA, (b) define the ATF Training System, and (c) complete the facilities and concurrency plans.

In FY90, it is planned to: (a) implement ATF aircraft prototypes, (b) review the training system definition reports by government and form an acquisition strategy, and (c) release the Request for Proposal (RFP).

## PAYOFF/UTILIZATION:

The payoff for this Project will be the provision of an Advanced Tactical Fighter (ATF) Training System which will account for all personnel needed by the weapon system, and will integrate all Manpower, Personnel, and Training aspects of each job description and skill level to ensure full mission support.

In FY88, specific accomplishments included: (a) reviewing major training system trade studies, and (b) continuing the FEA process.

## PROJECT OVERVIEW

		89	90
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PROJECT: 3282	C-17 AIRCREW TRAINING SYSTEM (ATS)	\$28.5M	\$31.8M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is designed to meet the needs of the Military Airlift Command (MAC), and the Air Reserve Forces (AFRES) in supplying the initial and continuation training for C-17 aircrew members.

Training will be totally contractor administered and supported, with MAC evaluating the final product--a fully qualified aircrew member. There will be a main facility for initial through instructor training, training facilities at four active duty bases and four Air Reserve Component bases for continuation training. Emphasis will be on integrated crew training and training tasks that cannot be accomplished in aircraft, including those related to safety of flight, emergency procedures, and others for which a suitable flight training environment does not exist. The training system will be developed concurrently with the aircraft design effort, allowing a training system to be available at the formation of the first operational squadron.

Acquisition of the actual C-17 ATS has been divided into two phases to sustain competition as long as possible. Phase I was a full and open competition to determine which company had the best capability to field and support an ATS. Three contractors were chosen to provide detailed functional designs of their total systems. Phase II will begin after the selection of one of these contractors to complete the final design, development, testing, deployment, activation, and operation and support of the training system.

This Project complies with OSD guidelines through early consideration of training needs with the parent weapon system, and development of a training system using best commercial practices.

In FY89, it is planned to: (a) down-select from three to one contractor, (b) continue the full scale development effort, and (c) conduct a preliminary design review.

In FY90, it is planned to: (a) conduct a critical design review, (b) begin fabrication of the training devices, and (c) initiate development of courseware.

## PAYOFF/UTILIZATION:

The payoff of this Project will be improved continuation training and mission/upgrade training for C-17 crew members, through the development of a centralized training facility, and development of learning centers at each of four operational wings and two reserve sites.

In FY88, specific accomplishments included: (a) three, Phase I, C-17 ATS contractors developing functional descriptions of their system to best accomplish training for C-17 aircrews, (b) completing front-end analysis, and (c) defining the ATS.

## PROJECT OVERVIEW

		89	90
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PROJECT: 3772	C-141 AIRCREW TRAINING SYSTEM (ATS)	\$ 3.0M	\$ 9.1M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

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PROJECT SYNOPSIS:

The objective of this Project is a totally contracted effort for the ground and flight simulation aircrew training programs, including initial qualification, upgrade and continuation training, for all HQ MAC, HQ AFRES and ANG C-141 primary crew members.

The contractor will also provide for the logistics support of all ATS associated training equipment, and operate a training management system to track student progress, update the training programs, and interface with Air Force Operations Resource Management System. The ATS will be conducted on site at all C-141 operating locations, active and Air Reserve Components.

In FY89, it is planned to: (a) award the full-scale development contract with options for operation and maintenance support, (b) begin the training System Requirements Analysis (SRA), (c) conduct the Training System Review #1, and (d) begin media design.

In FY90, it is planned to: (a) conduct the training System Review #2, (b) begin courseware development, and (c) begin media development.

## PAYOFF/UTILIZATION:

The payoff of this Project includes the development of training courses for both ground and flight crews, and a training management system to track student progress.

This is a new Project start in FY89.

## PROJECT OVERVIEW

	89	90
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PROJECT: 3775	MANPOWER, PERSONNEL, AND \$ 0.0M	\$ 0.5M
	TRAINING	
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT	
CONGRESSIONAL CATEGORY:	MANPOWER & PERSONNEL	
DoD ORGANIZATION:	AF	
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS	

-----  
PROJECT SYNOPSIS:

The objective of this Project is to provide for the front-end analysis and studies to ensure MPT (Integrated Logistics Support elements) factors and constraints are developed for use during the early phases of the weapon system acquisition process (WSAP).

This Project will establish the needed data sources, analytical tools, and procedures which support Manpower, Personnel, and Training (MPT) trade-off analyses in the design. These analyses will emphasize life-cycle, cost-effective use of critical manpower, personnel and training resources.

In FY90, it is planned to: (a) develop an MPT Education Course, (b) initiate MPT studies and development of MPT models, and (c) begin development of the MPT Computer Supported Network Analysis System (CSNAS) prototype.

## PAYOFF/UTILIZATION:

The payoff of this Project is the establishing of needed data sources, analytical tools, and procedures which will support MPT trade-off analyses in the early phases of weapon system design.

This is a new Project start in FY90.

## PROGRAM ELEMENT OVERVIEW

PE: 64243F                      MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT

CONGRESSIONAL CATEGORY:      MANPOWER & PERSONNEL  
                                  EDUCATION & TRAINING  
                                  HUMAN FACTORS

DoD ORGANIZATION:            AF

FUNDING:                      FY89 \$ 0.0M (FY90 PRESIDENT'S BUDGET)  
                                  FY90 \$ 0.5M (FY90 PRESIDENT'S BUDGET)

## PE SYNOPSIS:

The objective of this new-start Program Element is to provide engineering development of maturing manpower, personnel, and training (MPT) technologies to ensure: (a) transitioning of those technologies from Air Force laboratories, and (b) fielding of MPT systems which are logistically supportable by the operational forces.

Historically, transition of MPT technologies to operational users has been ineffective, due to lack of a formal program to consider such things as long term reliability, maintainability, and logistics support. This Program Element will solve this problem and provide field technologies to improve the effectiveness of Air Force training development/delivery, performance assessment, personnel acquisition, job assignment, force management, and human performance in weapon systems.

The in-house developing organization responsible for this program is the Human Systems Division, Brooks AFB.

## RELATED ACTIVITIES:

Related Program Elements are: 0601102F, Defense Research Sciences; 0602205F, Personnel, Training and Simulation; 0603227F, Manpower, Personnel, Training and Simulation Technology; 0602233N, Mission Support Technology: Personnel, Training and Simulation Technology Area; 0602234N, Systems Support Technology: Human Factors Technology Area; 0603733N, Training Devices Technology; 0603720N, Education and Training; 0603707N, Manpower and Personnel Systems Development; 0603733N, Training Devices Technology; 0603720N, Education and Training; 0604703N, Training and Personnel Systems Development; 0602716A, Human Factors Engineering Technology Development; 0602727A, Non-System Training Devices Technology; 0602785A, Manpower, Personnel, and Training Technology; 0603007A, Human Factors, Personnel, and Training Advanced Development; 0604722A, Education and Training Systems.

There is no unnecessary duplication of effort within the Air Force or the Department of Defense.

## PAYOFF/UTILIZATION:

The payoffs anticipated from this Program Element will be more accurate selection and classification of individuals in the U.S. Armed Forces and will ensure an improved match of the individual's aptitudes with those of the job requirements.

This Program Element is a new start in FY90.



FUTURE DIRECTIONS:

In FY91, it is planned to: (a) conduct a critical design review of F-15 Avionics Troubleshooting Tutors, (b) conduct a critical design review of the advanced on-the-job training system, and (c) begin fabrication of the F-15 Avionics Troubleshooting Tutors.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: 3817	FORECEWIDE TRAINING	\$ 0.0M	\$ 0.5M
	SYSTEMS		
PE: 64243F	MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	HSD		

-----  
PROJECT SYNOPSIS:

The objectives of this Project are to: (a) capitalize on the advances in intelligent computer-aided instruction and computer engineering, and (b) focus on cost-effective, efficient delivery of training to the operational forces.

New and increasingly complex weapon systems and rapidly changing technology are vastly increasing Air Force training requirements, while training resources remain relatively fixed. This requires the Air Force to rely more heavily upon on-the-job training and more efficient methods of training, such as computer-based training. Also, programs, such as "Rivet Workforce", which combine related AF specialties, require maintenance technicians to be proficient on a broader range of systems and will require effective job-site training programs to augment initial and follow-on technical training.

In FY90, it is planned to: (a) begin full-scale development of an Air Force advanced on-the-job training system based upon the results of the Advanced Technology Development Project (Project 2557) in PE 0630227F, Personnel, Training, and Simulation Technology, and (b) begin full-scale development of F-15 Avionics Troubleshooting Tutors for the Tactical Air Command, based upon the results of the Advanced Technology Demonstration Project (Project 2949) in PE 0603227F.

## PAYOFF/UTILIZATION:

The payoffs of this Project will include: (a) increased efficiency in training methods, and (b) more cost-effective delivery of training for the operational Air Force.

This Project is a new start for FY90.

### III-C-1: LISTING OF AIR FORCE PROJECTS

TOTAL FUNDING IN PROGRAM ELEMENT 61102F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	9.111	9.020

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(CONTINUATION)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62202F						HUMAN SYSTEMS TECHNOLOGY
06MD	HSD	4.121	4.529	HF	4	HUMAN SYSTEMS DIVISION LABORATORY OPERATIONS
6893	HSD	1.417	1.400	HF	4	MANNED WEAPON SYSTEMS EFFECTIVENESS
7184	HSD	5.855	6.488	HF	4	MAN-MACHINE INTEGRATION TECHNOLOGY
		----- 11.394	----- 12.417			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62202F :						
						FY89      FY90
						-----      -----
						THE PRESIDENT'S BUDGET, JANUARY 1989    11.393    12.417

(CONTINUED)

(CONTINUATION)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-ET	AFHRL	2.960	3.418	ET	V A R	LABORATORY SUPPORT
06HT-HF	AFHRL	1.939	2.239	HF	V A R	LABORATORY SUPPORT
06HT-MP	AFHRL	2.144	2.475	MP	V A R	LABORATORY SUPPORT
06HT-ST	AFHRL	3.164	3.653	ST	V A R	LABORATORY SUPPORT
1121	AFHRL	1.950	1.860	ET	6	TECHNICAL TRAINING DEVELOPMENT
1123	AFHRL	2.793	2.070	ET	6	FLYING TRAINING DEVELOPMENT
1192	AFHRL	5.456	4.866	ST	6	ADVANCED SIMULATION FOR PILOT TRAINING
1710	AFHRL	3.640	2.991	HF	4	LOGISTICS AND MAINTENANCE TECHNOLOGY
3017	AFHRL	1.395	1.090	ET	6	COMMAND AND CONTROL TRAINING
6114	AFHRL	1.215	0.830	ST	6	FLIGHT SIMULATOR TECHNOLOGY
7719	AFHRL	3.370	2.746	MP	2	FORCE ACQUISITION AND DISTRIBUTION SYSTEM
7734	AFHRL	0.827	0.780	MP	3	FORCE MANAGEMENT SYSTEM
		----- 30.854	----- 29.018			TOTAL IN PE

(CONTINUED)

(CONTINUATION WITHIN PE 62205F)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
=====					
TOTAL FUNDING IN PROGRAM ELEMENT 62205F :			FY89	FY90	
			-----	-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			30.853	29.018	
-----					

(CONTINUED)

(CONTINUATION)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63106F						LOGISTICS SYSTEMS TECHNOLOGY
2745	AFHRL	3.175	0.075	HF	4A	LOGISTICS FOR COMBAT READINESS MAINTENANCE
2940	AFHRL	5.836	3.931	HF	4D	COMPUTER TECHNOLOGY FOR SYSTEMS DESIGN AND MAINTENANCE
2950	AFHRL	5.951	5.610	HF	4D	INTEGRATED MAINTENANCE INFORMATION SYSTEM
		14.962	9.616			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63106F :						FY89 FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						14.962 9.616

(CONTINUED)

(CONTINUATION)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2363	AFHRL	1.048	0.400	ST	6	ADVANCED VISUAL TECHNOLOGY SYSTEM
2364	AFHRL	1.000	0.000	ET	6	TRAINING AND PERFORMANCE DATA CENTER
2557	AFHRL	1.270	0.000	ST	6	ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)
2743	AFHRL	3.208	3.790	ST	6	AIRCREW COMBAT MISSION ENHANCEMENT (ACME)
2922	AFHRL	0.691	0.739	MP	2	PERSONNEL ASSESSMENT SYSTEMS
2949	AFHRL	0.821	1.200	ET	6	BASIC JOB SKILLS ASSESSMENT AND ENHANCEMENT
3057	AFHRL	0.470	1.700	ST	6	INTELLIGENT COMPUTER-ASSISTED TRAINING (ICAT)
		8.509	7.830			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						FY89      FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						8.503      7.829

(CONTINUED)



(CONTINUATION)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63231F						CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY
2829	AMD	5.528	5.585	HF	4	COCKPIT AUTOMATION TECHNOLOGY (CAT)
2992	AMD	1.008	1.010	HF	4	SPACE CREW ENHANCEMENT (SPACE)
		----- 6.536	----- 6.596			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63231F :						
						FY89
						-----
THE PRESIDENT'S BUDGET, JANUARY 1989						6.536
						-----
						FY90
						-----
						6.595

(CONTINUED)

(CONTINUATION)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
2325	TS SPO	2.023	3.085	ST	6	SIMULATOR DEVELOPMENT ACTIVITIES
2769	TS SPO	5.373	2.000	ST	6	SIMULATOR UPDATE DEVELOPMENT
2851	TS SPO	3.104	2.300	ST	6	STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM
2901	TS SPO	6.507	5.500	ST	6	B-1B WEAPON SYSTEM TRAINER (WST)
2968	TS SPO	1.936	0.300	ST	6	MODULAR SIMULATOR DESIGN
2997	TS SPO	0.535	0.000	ST	6	GBU-15 PART TASK TRAINER
2998	TS SPO	7.300	0.600	ST	6	LOW ALTITUDE NAVIGATION AND TARGETING INFRARED SYSTEM FOR NIGHT (LANTIRN) SIMULATOR
2999	TS SPO	0.249	0.000	ST	6	LANTIRN PART TASK TRAINER
3000	TS SPO	0.088	0.000	ST	6	KC-135 OPERATIONAL FLIGHT TRAINER
3105	TS SPO	0.128	0.000	ST	6	F-15E WEAPON SYSTEM TRAINER (WST)
3135	TS SPO	2.580	10.000	ET	6	ADVANCED TRAINING SYSTEM (ATS)
3143	TS SPO	1.900	0.000	ET	6	ADVANCED TACTICAL FIGHTER (ATF)
3282	TS SPO	28.467	31.801	ET	6	C-17 AIRCREW TRAINING SYSTEM (ATS)
3772	TS SPO	2.950	9.100	ET	6H	C-141 AIRCREW TRAINING

(CONTINUED)

(CONTINUATION WITHIN PE 64227F)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
-----					
					SYSTEM (ATS)
3775	TS SPO	0.000	0.500 MP	2A	MANPOWER, PERSONNEL, AND TRAINING
		-----	-----		
		63.141	65.187		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64227F :			FY89	FY90	
			-----	-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			63.141	65.186	
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(CONTINUED)

### III-D-1: LISTING OF DLA PROJECTS

TOTAL FUNDING IN PROGRAM ELEMENT 64722S :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	9.773	8.978

(CONTINUATION)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
64243F					MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT
3817	HSD	0.000	0.497 ET	6F	FORECEWIDE TRAINING SYSTEMS
		----- 0.000	----- 0.498		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64243F :					
					FY89      FY90
					-----    -----
					THE PRESIDENT'S BUDGET, JANUARY 1989    0.000    0.497

III.C. DLA PROGRAM ELEMENT AND PROJECT SYNOPSES

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PE	TITLE	PAGE
64722S	MANPOWER AND TRAINING SYSTEMS DEVELOPMENT	III-D-1

Table III-C-1: Listing of Projects - Lists projects for each DLA program element. Lists contain performing organization, funding, Congressional Category and goal information.

III-D-i

## PROGRAM ELEMENT OVERVIEW

PE: 64722S                      JOINT SERVICES MANPOWER AND TRAINING SYSTEMS  
CONGRESSIONAL CATEGORY:      EDUCATION & TRAINING  
DoD ORGANIZATION:            DLA  
  
FUNDING:                      FY89 \$ 9.8M (FY90 PRESIDENT'S BUDGET)  
                                 FY90 \$ 9.0M (FY90 PRESIDENT'S BUDGET)

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## PE SYNOPSIS:

The objective of this Program Element is to consolidate existing Program Elements to achieve more effective management of the joint-Service applications of new and emerging technologies to improve training and performance.

The Projects within this Program Element expedite rapid prototype development and transition to users who benefit from high payoff manpower and training technological products. The program promotes early identification of successful single-Service efforts that can be employed on a multi-Service/DoD-wide basis for military operations and training.

This is a new Program Element that consolidates relevant portions of existing Program Elements 63007A, 63733N, 63227F, and 64722A.

The responsible organizations for the work within this Program Element will be Defense Logistics Agency and Training Performance Data Center.

## RELATED ACTIVITIES:

Not applicable.

## PAYOFF/UTILIZATION:

The payoffs of this Program Element includes early identification of successful single-Service efforts that can be employed on a multi-Service/DoD-wide basis for improvement of military operations and training.

## FUTURE DIRECTIONS:

In FY91, plans for the Manpower and Training Systems Development Project include: (a) provide guidelines for automating and transporting resident courses for non-technical instruction, (b) evaluate and transition an automated technique to utilize logistics support data with instructional design methods to identify weapon system training and training equipment needs, and (c) develop a portable device that presents explosive ordnance data for identifying munitions and procedures for rendering munitions safe.

In FY91, plans for the Integration of Training and Performance Data Project include to: (a) develop a system to track, standardize, and distribute Service training course data/information throughout DoD, (b) establish a system for tracking training technology and its application for more effective training, and (c) evaluate training facility capabilities by geographic location for better Reserve Component utilization.

## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: 0001	MANPOWER AND TRAINING	\$ 5.9M	\$ 5.0M
	SYSTEMS DEVELOPMENT		
PE: 64722S	JOINT SERVICES MANPOWER AND TRAINING SYSTEMS		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	DLA		
RESPONSIBLE ORGANIZATION:	DEFENSE LOGISTICS AGENCY		

-----  
PROJECT SYNOPSIS:

The objective of this Project is to rapidly prototype, test, and evaluate manpower and training technologies for multi-Service implementation, with possible transition to public and private sectors.

In FY89, plans include: (a) evaluating the system for estimating simulator effectiveness, (b) demonstrating an "intelligent" conduct-of-fire trainer, and (c) demonstrating a cockpit management system for pilot aiding during combat.

In FY90, plans include to: (a) provide guidelines for automating and transporting resident courses for non-technical instruction, (b) evaluate and transition an automated technique to utilize logistics support data with instructional design methods to identify weapon system training and training equipment needs, and (c) develop a portable device that presents explosive ordnance data for identifying munitions and procedures for rendering munitions "safe."

## RELATED ACTIVITIES:

Not applicable.

## PAYOFF/UTILIZATION:

The payoff of this Project is rapid prototyping of technologies from the Services' R&D tech base, aligned with Service needs, which accelerates their demonstration and transition to use faster than is otherwise typical.

In FY88, specific accomplishments included: (a) development of the design for a portable, computerized system for presenting technical instruction in the field, (b) demonstration of a trainer for radar intercept operators, and (c) assessment of the benefits of a computerized handheld trainer.



## PROJECT OVERVIEW

		89	90
		----	----
PROJECT: 0002	INTEGRATION OF TRAINING AND PERFORMANCE DATA	\$ 3.9M	\$ 4.0M
PE: 64722S	JOINT SERVICES MANPOWER AND TRAINING SYSTEMS		
CONGRESSIONAL CATEGORY:	EDUCATION & TRAINING		
DoD ORGANIZATION:	DLA		
RESPONSIBLE ORGANIZATION:	TRAINING PERFORMANCE DATA CENTER		

-----  
PROJECT SYNOPSIS:

The objective of this Project is to develop multi-Service training and performance related tools, techniques, models, methods, and databases in response to priority needs of the Joint Community, Active and Reserve Components, and OSD.

In FY89, plans include to: (a) develop an early warning system to identify MPTS requirements throughout the weapon system acquisition process, and (b) create standard Force data files to reduce cost and manpower for training exercise development.

In FY90, plans include to: (a) develop a system to track, standardize, and distribute Service training course data/information throughout DoD, (b) establish a system for tracking training technology and its application for more effective training, and (c) evaluate training facility capabilities by geographic location for better Reserve Component utilization.

## RELATED ACTIVITIES:

Not applicable.

## PAYOFF/UTILIZATION:

The payoff of this Project is to support Service requirements to improve performance measures and the effectiveness and efficiency of military training.

Products are developed in close coordination with end users to ensure transition to the operational environment.

In FY88, specific accomplishments included: (a) development of a database which identifies capabilities of ranges and training areas within DoD, (b) application of artificial-intelligence technology to improve tracking of lessons learned for training exercises, and (c) establishment of a database to track existing applications of training equipment within DoD.

### III-D-1: LISTING OF DLA PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64722S						JOINT SERVICES MANPOWER AND TRAINING SYSTEMS
0001	DLA	5.872	4.991	ET	6F	MANPOWER AND TRAINING SYSTEMS DEVELOPMENT
0002	TPDC	3.901	3.987	ET	6E	INTEGRATION OF TRAINING AND PERFORMANCE DATA
		9.774	8.979			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 64722S :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	9.773	8.978

IV. OVERALL SYNOPSES AND PROJECT LISTINGS

IV.A. CONGRESSIONAL CATEGORY SYNOPSSES AND LISTINGS

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	CONGRESSIONAL CATEGORY	PAGE
	-----	-----
ARMY	Education and Training	IV-A-1
	Human Factors	IV-A-2
	Manpower and Personnel	IV-A-3
	Simulation and Training Devices	IV-A-4
NAVY	Education and Training	IV-A-5
	Human Factors	IV-A-6
	Manpower and Personnel	IV-A-7
	Simulation and Training Devices	IV-A-8
AIR FORCE	Education and Training	IV-A-9
	Human Factors	IV-A-10
	Manpower and Personnel	IV-A-11
	Simulation and Training Devices	IV-A-12
DLA	Education and Training	IV-A-13

Tables of project listings by Congressional Category follow each Congressional Category synopsis.

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING

DoD ORGANIZATION: ARMY

CONTRIBUTING  
PROGRAM ELEMENTS: 61102A DEFENSE RESEARCH SCIENCES

62785A MANPOWER, PERSONNEL, AND TRAINING  
TECHNOLOGY

63007A HUMAN FACTORS, PERSONNEL AND  
TRAINING ADVANCED TECHNOLOGY

64722A EDUCATION AND TRAINING SYSTEMS  
DEVELOPMENT

### SYNOPSIS:

This work focuses on developing and evaluating improved, cost-effective education and training applications for areas such as combat arms readiness and maintenance, and pilot and leadership training for the Active Army and the Reserve Component. Work will expand the applications of artificial intelligence, computers, and other electronic technology for training individual, crew/team, and unit collective skills.

The Army needs to provide job skills training and compensatory training for educationally disadvantaged personnel. Training literacy skills, are necessary to tailor training to maintain critical skills between Reserve Component training sessions. Specific job areas for attention include small arms training, navigation training, armor, aviation, supply maintenance, and logistics skill training.

Since the Army typically operates in units, it must know how people behave in organizations, how to evaluate group/unit performance and cohesion, and how to measure group improvement. Realistic battalion combat training is analyzed to determine the most effective methods for providing group performance feedback. Research will develop computer-based war games and simulators for company-level units to provide operationally realistic, inexpensive combined arms training.

Special attention is provided for combat service support training for battlefield maintenance tasks to assess and repair battle damage under difficult conditions, and to develop training programs for unconventional warfare.

At least three training products will be developed for use by more than one Service: (a) PEAM, a Portable Electronic Aid for Maintenance, (b) CHIP, the Computerized Hand-held Instructional Prototype, and (c) TRIADS, the Tri-Service Instructional Application Delivery System. Other efforts will establish a national manpower inventory to enable the Army to identify enlistee training needs more precisely.

IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
61102A						DEFENSE RESEARCH SCIENCES
B74F-ET	ARI	0.804	0.701		3	UNIT PERFORMANCE
	TOTAL:	0.805	0.701	(EDUCATION AND TRAINING IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 6110 :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

(CONTINUED)

(CONTINUATION)

IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ET	ARI	1.005	0.000	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A791-ET	ARI	1.524	3.592	6		MANPOWER, PERSONNEL AND TRAINING
TOTAL:		2.530	3.592	(EDUCATION AND TRAINING IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 62785A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	17.739	17.050

(CONTINUED)

(CONTINUATION)

IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A794	ARI	5.985	3.560	6		EDUCATION AND TRAINING
	TOTAL:	5.986	3.560	(EDUCATION AND TRAINING IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
					FY89	FY90
					-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989					29.198	18.965
-----						

(CONTINUED)



(CONTINUATION)

IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64722A						EDUCATION AND TRAINING SYSTEMS DEVELOPMENT
D750	ARI	6.872	1.978	6		EDUCATION AND TRAINING SYSTEMS DEVELOPMENT
TOTAL:		6.873	1.979	(EDUCATION AND TRAINING IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 64722A :						
						FY89
THE PRESIDENT'S BUDGET, JANUARY 1989						FY90
						6.872
						1.978

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: HUMAN FACTORS  
DoD ORGANIZATION: ARMY  
CONTRIBUTING  
PROGRAM ELEMENTS: 61102A DEFENSE RESEARCH SCIENCES  
62716A HUMAN FACTORS ENGINEERING  
TECHNOLOGY  
62785A MANPOWER, PERSONNEL, AND TRAINING  
TECHNOLOGY  
63007A HUMAN FACTORS, PERSONNEL AND  
TRAINING ADVANCED TECHNOLOGY

### SYNOPSIS:

A principal objective of Army work in Human Factors is to ensure the operability, maintainability, sustainability, and survivability of systems in various stages of development and deployment. These systems can increase potential battlefield effectiveness, but they are often sophisticated and require complex skills, heavy operator workload, quick reactions, and confident and accurate decisions to operate and maintain.

Engineering options must be considered during the entire developmental cycle to balance the demands with projected availability of personnel who have appropriate skills. Some human operator competencies can be enhanced by task allocation methods or by system design. A major objective is to develop and evaluate methods to identify human factors, manpower, personnel, and training (HMPT) requirements early in system design. This includes methods to integrate new equipment into units in the field and embedding training in the design of new systems.

Research will use soldier performance data to: (a) develop better engineering design principles, (b) learn about the capabilities and limitations of men and women to improve performance predictions with equipment in field conditions, (c) apply the data throughout the Army materiel development process, (d) provide design guidance for all types of equipment that is worn, operated, or maintained by soldiers, and (e) determine which tasks are best performed by humans, which are best performed by robots and other hardware, and how to combine these components.

The Human Factors area investigates soldier-computer interfaces in systems such as C3I (Command, Control, Communications and Intelligence) systems. Other efforts in this area will exploit technology to support logistics systems analysis, ammunition supply systems, robotics, computer automation, and artificial intelligence as they relate to increased productivity.

IV-A-2 : LISTING OF ARMY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61102A						DEFENSE RESEARCH SCIENCES
B74A	HEL	3.133	3.080		4	HUMAN ENGINEERING
B74F-HF	ARI	1.200	1.046		4	DESIGNING SYSTEMS FOR PEOPLE
	TOTAL:	4.334	4.127			(HUMAN FACTORS IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

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(CONTINUATION)

IV-A-2 : LISTING OF ARMY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62716A						HUMAN FACTORS ENGINEERING TECHNOLOGY
A1QL	HEL	7.144	0.000	V A R		ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)
AH70	HEL	7.859	14.894	4		HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT
TOTAL:		15.003	14.894	(HUMAN FACTORS IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 62716A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	15.003	14.894

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(CONTINUATION)

IV-A-2 : LISTING OF ARMY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-HF	ARI	2.011	0.000	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A790-HF	ARI	2.708	2.300	4		HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
TOTAL:		4.720	2.300	(HUMAN FACTORS IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						
						FY89
THE PRESIDENT'S BUDGET, JANUARY 1989						17.739
						FY90
						17.050

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(CONTINUATION)

IV-A-2 : LISTING OF ARMY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A793	ARI	8.322	5.900	4		HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS
A796	HEL	0.000	0.700	4		HUMAN FACTORS ENGINEERING IN SYSTEMS DESIGN
TOTAL:		8.323	6.601	(HUMAN FACTORS IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 63007A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	29.198	18.965

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL  
DoD ORGANIZATION: ARMY  
CONTRIBUTING  
PROGRAM ELEMENTS: 61102A DEFENSE RESEARCH SCIENCES  
62785A MANPOWER, PERSONNEL, AND TRAINING  
TECHNOLOGY  
63007A HUMAN FACTORS, PERSONNEL AND  
TRAINING ADVANCED TECHNOLOGY

### SYNOPSIS:

The Army and the other Services will continue to share a dwindling supply of young adults while meeting demands for high technology skills to operate and maintain many complex weapon systems. The Army must effectively recruit, select, assign, utilize, and retain adequate numbers, and is pursuing a strategy that can ensure that the most advanced tools for doing so are in the leaders' hands.

This research provides a scientific basis for the later development of: (a) improved, computer-based selection and assignment tests, especially procedures to link soldier selection to job performance, (b) methods to examine new variables such as pre-service experiences, (c) methods to assign recruits to jobs that capitalize on their aptitudes and vocational interests, (d) programs to develop cohesive units and leaders needed to assure combat readiness, (e) methods to increase satisfaction and identification with, and commitment to, Army life, (f) methods to research the effects of the family on soldier retention, (g) methods to increase enlistment and reenlistment rates and reduce attrition rates of highly qualified soldiers, (h) techniques to examine and improve Army civilian personnel performance and management, and (i) methods to determine aggregated future manpower requirements in view of new systems and force structures in the battlefield of the future.

Basic research work will investigate how decision-makers function in computer-driven, high-stress, problem-solving situations. Efforts will help develop computerized aids for problem-solving, planning, and decision-making to overcome these situational difficulties.

Some recent accomplishments include research on what motivates enlistment, and how the leader and the unit environment affect individual soldier performance. New methods were developed for predicting job performance, and a database was established for tracking men and women who enlisted and did not enlist, and their reasons for doing so. Work continues on systems such as HARDMAN (hardware vs. manpower) and MIST (Man Integrated Systems Technology) to help predict or determine manpower, personnel, and training requirements of developing systems and to correlate these needs with available resources.

IV-A-3 : LISTING OF ARMY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
61102A						DEFENSE RESEARCH SCIENCES
B74F-MP	ARI	0.922	0.803		4B	PLANNING, PROBLEM SOLVING AND DECISION MAKING
	TOTAL:	0.923	0.804	(MANPOWER AND PERSONNEL IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

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(CONTINUATION)

IV-A-3 : LISTING OF ARMY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-MP	ARI	2.370	0.000	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A791-MP	ARI	3.909	9.102	2		MANPOWER, PERSONNEL AND TRAINING
TOTAL:		6.280	9.102	(MANPOWER AND PERSONNEL IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 62785A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	17.739	17.050

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(CONTINUATION)

IV-A-3 : LISTING OF ARMY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A792	ARI	9.908	6.499	2		MANPOWER AND PERSONNEL
	TOTAL:	9.908	6.500	(MANPOWER AND PERSONNEL IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 63007A :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	29.198	18.965

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## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES  
DoD ORGANIZATION: ARMY  
CONTRIBUTING  
PROGRAM ELEMENTS: 61102A DEFENSE RESEARCH SCIENCES  
62727A NON-SYSTEM TRAINING DEVICES  
(NSTD) TECHNOLOGY  
62785A MANPOWER, PERSONNEL, AND TRAINING  
TECHNOLOGY  
63003A AVIATION ADVANCED TECHNOLOGY  
63007A HUMAN FACTORS, PERSONNEL AND  
TRAINING ADVANCED TECHNOLOGY  
64715A NON-SYSTEM TRAINING DEVICES -  
ENGINEERING DEVELOPMENT  
64801A AVIATION ENGINEERING DEVELOPMENT

### SYNOPSIS:

The objective for the Armys research on simulation and training devices is combat readiness. Work focuses on high-fidelity devices which simulate realistic combat scenarios, yet remain relatively low in cost and lower in complexity than previous simulators.

A major requirement is to develop devices that apply new techniques and technologies in artificial intelligence, computer-aided instruction, and robotic computers to accelerate learning, increase attention and increase mental and physical peak performance to sustain troops in combat. Army embedded training and combined arms training efforts will also be advanced.

Work continues on developing techniques such as videodisks and laser-based weapon simulation for improved war game battle simulations, and for the development of technology for multi-purpose training devices.

The aim of simulation development is to improve pilot training and safety while reducing costs and supporting helicopter engineering development. Basic research includes investigating the nature of knowledge representation and transfer, the effects of expertise in complex task domains, and the major objective is to continue research developing improved training systems such as: (a) low-cost flight simulators, (b) armor and anti-armor, artillery and infantry training, (c) training devices that tie together battlefield weapon systems, mobility, and command, control, communications, and intelligence, and (d) systems that provide full mission training capability in a combat environment. These training systems will provide effective, low-cost tactical training for both Active Army and Reserve Components, for both maintenance and combat service support personnel.

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
62727A						NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY
A230	PMTRADE	3.429	4.424	6		NON-SYSTEM TRAINING DEVICES
TOTAL:		-----	-----			
		3.430	4.425	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62727A :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ST	ARI	1.795	0.000	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A790-ST	ARI	2.417	2.056	6		HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
TOTAL:		4.213	2.056	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						
					FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989					17.739	17.050

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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63003A						AVIATION ADVANCED TECHNOLOGY
DB34	AVSCOM	4.035	3.152	6		ROTORCRAFT SYSTEM INTEGRATION SIMULATOR (RSIS)
DB39	PMTRADE	1.344	0.870	6		FLIGHT SIMULATOR COMPONENTS
	TOTAL:	5.379	4.023			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 63003A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	5.379	4.022

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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A795	ARI	4.983	2.306	6		TRAINING SIMULATION
	TOTAL:	4.984	2.306	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715A						NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT
D241	PMTRADE	15.251	29.198	6		NON-SYSTEM TRAINING DEVICES COMBINED ARMS
D573	PMTRADE	6.539	8.568	6B		PROJECT MANAGER FOR TRAINING DEVICES AND NAVAL TRAINING SYSTEMS CENTER SUPPORT
TOTAL:		21.791	37.766	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 64715A :						
					FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989					21.790	37.766

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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64801A						AVIATION ENGINEERING DEVELOPMENT
D275	PMTRADE	4.389	7.413	6D		SYNTHETIC FLIGHT TRAINING SYSTEMS
DE70	PMTRADE	2.785	4.286	6D		AVIATION NON-SYSTEM TRAINING DEVICES
TOTAL:		7.175	11.700	(SIMULATION AND TRAINING DEVICES IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 64801A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	7.174	11.699

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING  
DoD ORGANIZATION: NAVY  
CONTRIBUTING  
PROGRAM ELEMENTS: 61153N DEFENSE RESEARCH SCIENCES,  
SUBELEMENT 42: BEHAVIORAL AND  
ORGANIZATIONAL SCIENCES  
62233N MISSION SUPPORT TECHNOLOGY:  
PERSONNEL, TRAINING AND  
SIMULATION TECHNOLOGY AREA  
63720N EDUCATION AND TRAINING  
63732M ADVANCED MANPOWER/TRAINING SYSTEMS

### SYNOPSIS:

The objective of the Navy effort in Education and Training is to support effective training of military personnel through advancement of training technology, development of training standards, and improvement of procedures for matching training to job requirements.

The major areas of activity for this effort include the systems, cognitive processes, automated instruction in formal schools, basic skills enhancement, individual and group performance measurement, individual and team training, Naval Reserve training, on-the-job training, weapon system operator/maintainer training, training materials development, resource management, Enlisted Personnel Individualized Career System (EPICS), leadership criteria development, recruit/post-recruit training personnel attrition, enhancement of generic problem-solving ability among Naval Officers, and development of training standards for collective tasks performed by combat service support groups.

The benefits of this effort include the following: (a) solution of many training problems in the Navy through the introduction of more individualized, automated, and simulator-based instruction, better training standards for all unit levels, and improved less manpower-intensive procedures for matching training to job requirements, (b) deferred and reduced shore-based training for first-term enlistees, with on-job effectiveness maintained through EPICS, (b) reduced costs of preparing instructional materials for critical programs through use of authoring instructional materials, (d) more lower-cost practice of critical skills through advanced computer-aided instruction, (e) reduced training time, improved student motivation, and increased ability to perform critical tasks through functional context training, (f) improved decision-making about the use of computer-based training technology, (g) reduced scheduling inefficiencies and improved training outcomes through training resource management, and (h) improved performance in multi-ship, multi-threat warfare through team training instructional system development.

IV-A-5 : LISTING OF NAVY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04206	ONR	6.324	7.741		6	PERSONNEL AND TRAINING
	TOTAL:	6.325	7.742			(EDUCATION AND TRAINING IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	11.498	14.075

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IV-A-5 : LISTING OF NAVY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33T23	NPRDC	1.444	1.498	6		EDUCATION AND TRAINING TECHNOLOGY
TOTAL:		1.444	1.498	(EDUCATION AND TRAINING IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62233N :						
THE PRESIDENT'S BUDGET, JANUARY 1989						

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(CONTINUATION)

IV-A-5 : LISTING OF NAVY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
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63720N						EDUCATION AND TRAINING
R1772	NPRDC	6.153	6.376	6		EDUCATION AND TRAINING
	TOTAL:	6.154	6.377	(EDUCATION AND TRAINING IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 63720N :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	6.153	6.376

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## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: HUMAN FACTORS  
DoD ORGANIZATION: NAVY  
CONTRIBUTING  
PROGRAM ELEMENTS: 61153N DEFENSE RESEARCH SCIENCES,  
SUBELEMENT 42: BEHAVIORAL AND  
ORGANIZATIONAL SCIENCES  
62234N SYSTEMS SUPPORT TECHNOLOGY: HUMAN  
FACTORS TECHNOLOGY AREA  
63701N HUMAN FACTORS ENGINEERING  
DEVELOPMENT  
63739N NAVY LOGISTICS PRODUCTIVITY

### SYNOPSIS:

The objectives of the Navy effort in Human Factors are to: (a) develop enhanced group decision-making procedures through research in decision making, perception, and human-computer interaction, (b) develop technology to manage and present information for rapid and accurate assimilation, (c) develop a systems-oriented human performance database, the methods to define human functional capabilities, and the interface requirements in the context of aviation systems and missions, (d) provide Navy systems developers with the resources and expertise to implement advanced concepts, (e) improve combat effectiveness and survivability through applications of man-machine integration methods in the design and updating of airborne systems, (f) design, develop, test, and evaluate new process control techniques for improving the quality and productivity of the repair and overhaul of Navy ships and aircraft, (g) improve the process of identifying, applying, and evaluating new technology in Navy shore support activities, and (h) develop and utilize more human factors engineering (HFE) techniques to help solve man-machine interface problems.

Developmental efforts include: (a) systematic knowledge/technology bases and appropriate assessment methods for matching performance capabilities to system requirements, (b) adaptive interactive displays, expert systems, and computer-based aids for enhanced decision making, (c) improved systems design in combat/engineering systems, shipboard administration and logistical data processing, and electronic maintenance and troubleshooting, (d) quality control and productivity in the repair and overhaul of ships and aircraft, and (e) identification and application of state-of-the-art technology to critical repair, maintenance, and acquisition problems in support functions.

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IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
62234N						SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA
RS34H20	NOSC	3.550	3.700	4		HUMAN FACTORS TECHNOLOGY
RS34H21	NPRDC	0.600	0.550	5A		BIOPSYCHOMETRIC ASSESSMENT
	TOTAL:	4.151	4.251			(HUMAN FACTORS IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 62234N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	4.150	4.250

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IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63701N						HUMAN FACTORS ENGINEERING DEVELOPMENT
R1771	NOSC	1.605	1.663	4		SHIP HUMAN FACTORS ENGINEERING DEVELOPMENT
W0542	NADC	0.849	0.880	4		AIR HUMAN FACTORS ENGINEERING TECHNOLOGY
TOTAL:		2.454	2.544			(HUMAN FACTORS IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 63701N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	2.454	2.543

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IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

61153N DEFENSE RESEARCH SCIENCES,  
SUBELEMENT 42: BEHAVIORAL  
AND ORGANIZATIONAL SCIENCES

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	11.498	14.075

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(CONTINUATION)

IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63739N						NAVY LOGISTICS PRODUCTIVITY
T1885	NPRDC	0.976	1.187	3		QUALITY IMPROVEMENT
T1886	NPRDC	0.488	0.259	3		NEW TECHNOLOGY
	TOTAL:	1.464	1.447			(HUMAN FACTORS IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 63739N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	1.464	1.446

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## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL

DoD ORGANIZATION: NAVY

CONTRIBUTING  
PROGRAM ELEMENTS:

- 61153N DEFENSE RESEARCH SCIENCES,  
SUBELEMENT 42: BEHAVIORAL AND  
ORGANIZATIONAL SCIENCES
- 62131M MARINE CORPS LANDING FORCE  
TECHNOLOGY
- 62233N MISSION SUPPORT TECHNOLOGY:  
PERSONNEL, TRAINING AND  
SIMULATION TECHNOLOGY AREA
- 63707N MANPOWER AND PERSONNEL SYSTEMS
- 63732M ADVANCED MANPOWER/TRAINING SYSTEMS
- 64703N PERSONNEL, TRAINING, SIMULATION,  
AND HUMAN FACTORS

### SYNOPSIS:

The objectives of the Navy effort in Manpower and Personnel are to: (a) increase understanding of the psychological and organizational variables that determine the performance of individuals, groups, teams, and units, (b) develop and evaluate systems to improve manpower requirements determination and personnel utilization, and (c) develop managerial and statistical concepts and techniques that will lead to more cost-effective personnel management.

The major areas of activity for this effort include development of: (a) theories and models of small, task-oriented team performance, (b) a computerized adaptive testing (CAT) system to replace the Armed Services Vocational Aptitude Battery (ASVAB) for selection and classification, (c) a neuro-electric and neuro-magnetic recording capability as part of the biopsychometric measurement project, (d) user-friendly techniques to summarize and synthesize data to enhance manpower decision making and improve force management capabilities at reduced data management costs, (e) a methodology for developing reliable, valid, and useable job proficiency testing for Marine Corps enlisted personnel, (f) methods for improving the Navy selection/assignment process, recruiting techniques, retention of high-quality personnel, and personnel motivation and productivity, (g) enlistment selection criteria which is related to successful job performance, and (h) technology to increase training efficiency and effectiveness, and to improve training software transportability.

The benefit of the Navy efforts in this area will be improved personnel utilization and increased readiness through increased ability to respond to a wide variety of manpower/personnel issues.

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04208	ONR	2.759	3.378		3	GROUP PSYCHOLOGY
	TOTAL:	2.760	3.378			(MANPOWER AND PERSONNEL IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	11.498	14.075

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(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CF31P14	NPRDC	0.455	0.525	2		MARINE CORPS MANPOWER & TRAINING TECHNOLOGY
	TOTAL:	0.456	0.525			(MANPOWER AND PERSONNEL IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 62131M :						
THE PRESIDENT'S BUDGET, JANUARY 1989						

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(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33M20	NPRDC	2.640	2.738	2		MANPOWER AND PERSONNEL TECHNOLOGY
TOTAL:		2.641	2.738	(MANPOWER AND PERSONNEL IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 62233N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	6.700	6.950

(CONTINUED)

(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63707N						MANPOWER AND PERSONNEL SYSTEMS
R1770	NPRDC	3.976	4.115	2		MANPOWER AND PERSONNEL SYSTEMS
	TOTAL:	----- 3.977	----- 4.115	(MANPOWER AND PERSONNEL IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63707N :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63732M						ADVANCED MANPOWER/TRAINING SYSTEMS
C0073	HQMC	3.092	4.078	1A		HUMAN RESOURCES MANAGEMENT AND FORECASTING
TOTAL:		3.092	4.079	(MANPOWER AND PERSONNEL IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63732M :						
						FY89
						FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						3.092
						4.078

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(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64703N						PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
R1822	NPRDC	1.017	1.021	2		PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
TOTAL:		1.017	1.021	(MANPOWER AND PERSONNEL IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 64703N :						
						FY89
						FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						1.017
						1.021

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES  
DoD ORGANIZATION: NAVY  
CONTRIBUTING  
PROGRAM ELEMENTS: 62233N MISSION SUPPORT TECHNOLOGY:  
PERSONNEL, TRAINING AND  
SIMULATION TECHNOLOGY AREA  
63732M ADVANCED MANPOWER/TRAINING SYSTEMS  
63733N SIMULATION AND TRAINING DEVICE  
TECHNOLOGY  
64715N SURFACE WARFARE TRAINING

### SYNOPSIS:

The objectives of the Navy effort in Simulation and Training Devices are to: (a) develop technology to improve the training effectiveness of existing Navy simulators and training devices, and to lower their costs, (b) develop new trainers for weapon system training, flight training, and maintenance training, (c) upgrade the operational capability of Navy ASW aircraft with improved acoustic and non-acoustic sensors, (d) develop a training system for specialized ships, (e) develop a generic training system to replace obsolete/obsolescent devices for team tactical training, and (f) conduct front-end analysis of specific training problems by defining requirements/shortfalls, training objectives, and student loading, and identifying alternate solutions with related cost/training effectiveness trade-offs.

Developmental efforts include: (a) a prototype automated system to facilitate transfer of knowledge from a subject matter expert to an intelligent training system, (b) visual and sensor simulation for AI-based trainer designs, (c) realistic battle group-level training for senior Naval officers and their staffs, (d) a training device to provide individual and team training, (e) a training system to provide training in equipment operation, data acquisition/interpretation, and utilization in tactical combat exercises, (f) two trainers to meet the increasing need to train AIC and ASAC personnel, (g) a trainer for dynamic team training in skills essential to qualify enlisted ratings assigned to Combat Information Centers (CICs), (h) a modification of the TACDEW system to provide more modern radar capabilities, and incorporate a state-of-the-art problem control and evaluation subsystem, (i) training devices to replace the obsolete devices currently used to provide ASW team training, (j) operator/team trainers in electronic/acoustic surveillance in ASW operations, maintenance trainers for various electronic/acoustic devices and trainers, and other stimulation/simulation training device techniques, and (k) training requirements, through the HARDMAN study, for the Surface Warfare Community, and individually tailored, detailed trainer/training systems selection procedures.

IV-A-8 : LISTING OF NAVY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33T21	NTSC	1.493	1.511		6F	INSTRUCTIONAL TECHNOLOGY
RM33T24	NTSC	1.123	1.203		6	SIMULATION AND TRAINING DEVICE TECHNOLOGY
	TOTAL:	2.617	2.715			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 62233N :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	6.700	6.950

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(CONTINUATION)

IV-A-8 : LISTING OF NAVY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63733N						SIMULATION AND TRAINING DEVICE TECHNOLOGY
W1773	NTSC	6.451	6.685	6		SIMULATION AND TRAINING DEVICES
	TOTAL:	6.452	6.686			(SIMULATION AND TRAINING DEVICES IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 63733N :						
THE PRESIDENT'S BUDGET, JANUARY 1989		6.451	6.685			

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(CONTINUATION)

IV-A-8 : LISTING OF NAVY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715N						SURFACE WARFARE TRAINING
S1126	NTSC	0.044	0.000	6		SURFACE TOMAHAWK TRAINER
S1140	NTSC	2.484	0.999	6		TACTICAL ADVANCED COMBAT DIRECTION ELECTRONIC WARFARE (TACDEW) MODIFICATION
S1427	NTSC	11.193	7.395	6		SURFACE TACTICAL TEAM TRAINER
S1436	NTSC	1.451	0.000	6		SURFACE WARFARE TRAINING ANALYSIS
S1834	NTSC	3.581	9.293	6		LANDING CRAFT AIR CUSHION (LCAC) OPERATOR TRAINER
TOTAL:		18.753	17.688			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 64715N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	18.753	17.687

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING

DoD ORGANIZATION: AIR FORCE

CONTRIBUTING  
PROGRAM ELEMENTS:

- 62205F PERSONNEL, TRAINING, AND  
SIMULATION
- 63227F PERSONNEL, TRAINING, AND  
SIMULATION TECHNOLOGY
- 64227F FLIGHT SIMULATOR DEVELOPMENT
- 64243F MANPOWER, PERSONNEL, AND TRAINING  
DEVELOPMENT

### SYNOPSIS:

The objectives within this area include the: (a) development of flight simulator hardware which will improve training and reduce training costs, (b) design and development of better simulators for maintenance training to eliminate the need for expensive operational equipment, (c) design and development of computer-based instructional technologies for technical and flight training, (d) development of improved courseware, training delivery options, training aids, and related products, (e) development of technology and programs to train, assess and aid command and control operators, especially in combat-related activities, and (f) development of new training technologies and logistics support methods which are expected to increase the productivity of Air Force personnel, improve the cost-effectiveness of technical and flight training, and result in enhanced operational readiness.

Recently completed accomplishments include: (a) development and testing of Air Force officer and enlisted specialty performance measurement technology, (b) initiating validation of the high school version of the Armed Services Vocational Aptitude Battery (ASVAB), (c) completion of the improved user-friendly Comprehensive Occupational Data Analysis Program (CODAP) software system, (d) development of instructional modules for identified job prerequisites, (e) development of specifications for evaluation of training effectiveness, and (f) development of initial specifications for the advanced Training Decision System (TDS).

Future efforts will continue to focus on the design, development and evaluation of new technologies for training personnel in technical areas such as maintenance, command and control, and flight training. Software and hardware developments in the areas of training, training management and aircraft logistics support will be pursued to provide enhanced training capabilities, improved C2 and C3 systems, and resulting benefits to overall personnel utilization and productivity.

IV-A-9 : LISTING OF AF IN EDUCATION AND TRAINING

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

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(CONTINUATION)

IV-A-9 : LISTING OF AF IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2364	AFHRL	1.000	0.000	6		TRAINING AND PERFORMANCE DATA CENTER
2949	AFHRL	0.821	1.200	6		BASIC JOB SKILLS ASSESSMENT AND ENHANCEMENT
TOTAL:		1.821	1.201	(EDUCATION AND TRAINING IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 63227F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	8.508	7.829

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(CONTINUATION)

IV-A-9 : LISTING OF AF IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
3135	TS SPO	2.580	10.000	6		ADVANCED TRAINING SYSTEM (ATS)
3143	TS SPO	1.900	0.000	6		ADVANCED TACTICAL FIGHTER (ATF)
3282	TS SPO	28.467	31.801	6		C-17 AIRCREW TRAINING SYSTEM (ATS)
3772	TS SPO	2.950	9.100	6H		C-141 AIRCREW TRAINING SYSTEM (ATS)
TOTAL:		35.898	50.902			(EDUCATION AND TRAINING IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 64227F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	63.141	65.186

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(CONTINUATION)

IV-A-9 : LISTING OF AF IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64243F						MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT
3817	HSD	0.000	0.497	6F		FORECEWIDE TRAINING SYSTEMS
TOTAL:		0.000	0.498	(EDUCATION AND TRAINING IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 64243F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	0.000	0.497

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: HUMAN FACTORS  
DoD ORGANIZATION: AIR FORCE  
CONTRIBUTING  
PROGRAM ELEMENTS: 61102F DEFENSE RESEARCH SCIENCES  
62202F HUMAN SYSTEMS TECHNOLOGY  
62205F PERSONNEL, TRAINING, AND  
SIMULATION  
63106F LOGISTICS SYSTEMS TECHNOLOGY  
63231F CREW SYSTEMS AND PERSONNEL  
PROTECTION TECHNOLOGY  
64243F MANPOWER, PERSONNEL, AND TRAINING  
DEVELOPMENT

### SYNOPSIS:

The overall goal of the Air Force efforts in Human Factors is support of the planning, design and procurement of new aerospace systems. The main criteria for systems design are operability and maintainability, with concern also focused on survivability in hostile combat environments.

The basic assumption is that systems can be designed to be compatible with human capabilities and limitations. Objectives are to: (a) improve selection of personnel for appropriate jobs on the basis of measured mental abilities and sensory-motor skills, (b) design equipment to optimally match human workload and performance, (c) improve human performance in weapon systems and operations by refining crew selection, (d) establish threat characterization and integration into military space systems, (f) provide advanced development and demonstration of concepts to extend the performance of the crewman in the aerospace environment, (g) respond to the requirements of optimally integrating man into future military space systems, and (h) develop better training technologies to increase efficiency and productivity of Air Force personnel.

Recently completed accomplishments include: (a) theoretical and experimental work on human performance that explains performance in terms of allocation of a fixed processing resource among two or more competing tasks, (b) empirically tested evidence for a theory of visual discrimination, (c) initial design efforts for a multi-sensor, multi-cockpit combat mission training capability, and (d) efforts to analyze existing NASA and DoD programs for impact on military space crew members.

Efforts will continue in the areas of: (a) visual information processing, (b) development of new workload metrics, (c) performance prediction based on systematic investigation of parameters of learning ability, (d) development of dynamic models to predict operator stress limits and performance effectiveness, (e) development of design criteria and mission planning guides to reduce operator overload and optimize man-machine integration, (f) design and development of integrated display/control systems for airborne and aerospace missions, (g) development of needed tools and methodologies to extend air/aerospace (h) development of human factors performance definitions and design criteria applicable to demonstration of military crew stations for advanced aerospace systems, and (i) pursue improvements and cost savings in training and management of personnel i.e., simulation technology and computer technology.

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
-----						
61102F						DEFENSE RESEARCH SCIENCES
2313-A4	AFOSR	7.927	7.847		4	COGNITIVE SCIENCE
	TOTAL:	7.928	7.848	(HUMAN FACTORS IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 61102F :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	9.111	9.020

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(CONTINUATION)

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62202F						HUMAN SYSTEMS TECHNOLOGY
06MD	HSD	4.121	4.529	4		HUMAN SYSTEMS DIVISION LABORATORY OPERATIONS
6893	HSD	1.417	1.400	4		MANNED WEAPON SYSTEMS EFFECTIVENESS
7184	HSD	5.855	6.488	4		MAN-MACHINE INTEGRATION TECHNOLOGY
TOTAL:		11.394	12.417	(HUMAN FACTORS IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62202F :						
					FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989					11.393	12.417

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(CONTINUATION)

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-HF	AFHRL	1.939	2.239	V A R		LABORATORY SUPPORT
1710	AFHRL	3.640	2.991	4		LOGISTICS AND MAINTENANCE TECHNOLOGY
TOTAL:		5.580	5.231	(HUMAN FACTORS IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

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(CONTINUATION)

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63106F						LOGISTICS SYSTEMS TECHNOLOGY
2745	AFHRL	3.175	0.075	4A		LOGISTICS FOR COMBAT READINESS MAINTENANCE
2940	AFHRL	5.836	3.931	4D		COMPUTER TECHNOLOGY FOR SYSTEMS DESIGN AND MAINTENANCE
2950	AFHRL	5.951	5.610	4D		INTEGRATED MAINTENANCE INFORMATION SYSTEM
TOTAL:		-----	-----			
		14.962	9.616	(HUMAN FACTORS IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63106F :						
						FY89
						-----
THE PRESIDENT'S BUDGET, JANUARY 1989						14.962
						FY90
						-----
						9.616
-----						

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(CONTINUATION)

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63231F						CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY
2829	AMD	5.528	5.585	4		COCKPIT AUTOMATION TECHNOLOGY (CAT)
2992	AMD	1.008	1.010	4		SPACE CREW ENHANCEMENT (SPACE)
TOTAL:		6.536	6.596	(HUMAN FACTORS IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63231F :						
						FY89
						FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						6.536
						6.595

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL  
DoD ORGANIZATION: AIR FORCE  
CONTRIBUTING  
PROGRAM ELEMENTS: 61102F DEFENSE RESEARCH SCIENCES  
62205F PERSONNEL, TRAINING, AND  
SIMULATION  
63227F PERSONNEL, TRAINING, AND  
SIMULATION TECHNOLOGY  
64243F MANPOWER, PERSONNEL, AND TRAINING  
DEVELOPMENT

### SYNOPSIS:

The objective of work in the Manpower and Personnel area is to incorporate two interrelated streams of research designed to address the problems involved in acquiring and maintaining a quality force by developing the technology to enhance selection, assignment, training and retention of that force.

The Air Force efforts require a continuing supply of high-quality personnel who can operate and maintain sophisticated weapon and support systems. To this end, research efforts intend to: (a) develop and validate personnel testing procedures, (b) determine and measure specific requirements for Air Force jobs, (c) improve the process for matching individuals to jobs, (d) develop models and strategies to improve retention, (e) develop comprehensive skills management and reenlistment/career assignment programs, (f) measure and evaluate job performance and link enlistment standards to on-the-job performance, and (g) automate procedures to address fundamental training management issues.

Recent accomplishments include: (a) an integrated pilot selection system using perceptual and psychomotor measures, (b) completion of development of ninth and tenth grade norms for the Armed Services Vocational Aptitude Battery (ASVAB), (c) implementation of a new edition of the Air Force Officer Qualifying Test (AFOQT) and of a field-tested officer training school selection system, (d) completion of a model to select candidates for medical school scholarships and a database tracking system to provide long-term validity of the selection policy, and (e) completion of a model to determine both pre- and post-enlistment factors influencing career interests and actual separation or retention behavior.

Research efforts will continue to: (a) revise the AFOQT and subsets of the ASVAB, (b) develop, demonstrate and evaluate computer systems for use in selection and classification, (c) detail assessment of job specifications and skill requirements, (d) evaluate a variety of personnel assignment algorithms, and (e) improve and implement training decision systems.

IV-A-11 : LISTING OF AF IN MANPOWER AND PERSONNEL

TOTAL FUNDING IN PROGRAM ELEMENT 61102F :	FY89	FY90
	<u>          </u>	<u>          </u>
THE PRESIDENT'S BUDGET, JANUARY 1989	9.111	9.020

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(CONTINUATION)

IV-A-11 : LISTING OF AF IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-MP	AFHRL	2.144	2.475	V A R		LABORATORY SUPPORT
7719	AFHRL	3.370	2.746	2		FORCE ACQUISITION AND DISTRIBUTION SYSTEM
7734	AFHRL	0.827	0.780	3		FORCE MANAGEMENT SYSTEM
	TOTAL:	6.342	6.002			(MANPOWER AND PERSONNEL IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

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(CONTINUATION)

IV-A-11 : LISTING OF AF IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2922	AFHRL	0.691	0.739	2		PERSONNEL ASSESSMENT SYSTEMS
	TOTAL:	0.692	0.739			(MANPOWER AND PERSONNEL IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						
						FY89
						FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						8.508
						7.829

(CONTINUED)

IV-A-11 : LISTING OF AF IN MANPOWER AND PERSONNEL

TOTAL FUNDING IN PROGRAM ELEMENT 64227F :	FY89	FY90
	<u>        </u>	<u>        </u>
THE PRESIDENT'S BUDGET, JANUARY 1989	63.141	65.186

## CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES  
DoD ORGANIZATION: AIR FORCE  
CONTRIBUTING  
PROGRAM ELEMENTS: 62205F PERSONNEL, TRAINING, AND  
SIMULATION  
63227F PERSONNEL, TRAINING, AND  
SIMULATION TECHNOLOGY  
64227F FLIGHT SIMULATOR DEVELOPMENT

### SYNOPSIS:

The main objective in the Simulation and Training Devices area is the continuing development of aircrew flight simulator techniques and training devices. This work explores technologies such as computer image generation, holography, digital imaging, radar simulation, embedded training concepts, and infrared systems. Some visual simulation objectives include better image definition, color representation, and image dynamics, development of full field-of-view displays, and the accurate representation of special sensors.

While much of the focus is on pilot and navigator training, particularly in training and retraining of combat skills, attention is also being given to command and control and maintenance functions. Research efforts intend to: (a) upgrade trainers and simulators to provide greater realism and to improve the concurrency between changing aircraft features and flight simulators, (b) reduce life-cycle costs, (c) integrate a variety of hardware and software systems, (d) improve the instructional features of equipment, (e) develop multi-task as well as part-task trainers, (f) develop computer-based systems for authoring of training, information presentation, drill and practice, testing and evaluation, and training management, (g) develop databases, including transportable databases, for simulation programs, (h) develop continuation training and mission/upgrade training, (i) develop integrated crew training, (j) develop simulated video, environmental effects and gaming scenarios, and (k) simulate day, night, under-the-weather conditions for training pilots and navigators.

Recent achievements within this category include the development of an operational flight trainer which provides a training environment for the EF-111 mission, including the capability of simulating the central European radar environment and all aircraft flight profiles.

(CONTINUATION)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2363	AFHRL	1.048	0.400	6		ADVANCED VISUAL TECHNOLOGY SYSTEM
2557	AFHRL	1.270	0.000	6		ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)
2743	AFHRL	3.208	3.790	6		AIRCREW COMBAT MISSION ENHANCEMENT (ACME)
3057	AFHRL	0.470	1.700	6		INTELLIGENT COMPUTER-ASSISTED TRAINING (ICAT)
TOTAL:		5.997	5.891			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 63227F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	8.508	7.829

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(CONTINUATION)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-ST	AFHRL	3.164	3.653	V A R		LABORATORY SUPPORT
1192	AFHRL	5.456	4.866	6		ADVANCED SIMULATION FOR PILOT TRAINING
6114	AFHRL	1.215	0.830	6		FLIGHT SIMULATOR TECHNOLOGY
TOTAL:		9.835	9.349			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

(CONTINUED)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

TOTAL FUNDING IN PROGRAM ELEMENT 61102F :	FY89	FY90
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THE PRESIDENT'S BUDGET, JANUARY 1989	9.111	9.020

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(CONTINUATION)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
2325	TS SPO	2.023	3.085	6		SIMULATOR DEVELOPMENT ACTIVITIES
2769	TS SPO	5.373	2.000	6		SIMULATOR UPDATE DEVELOPMENT
2851	TS SPO	3.104	2.300	6		STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM
2901	TS SPO	6.507	5.500	6		B-1B WEAPON SYSTEM TRAINER (WST)
2968	TS SPO	1.936	0.300	6		MODULAR SIMULATOR DESIGN
2997	TS SPO	0.535	0.000	6		GBU-15 PART TASK TRAINER
2998	TS SPO	7.300	0.600	6		LOW ALTITUDE NAVIGATION AND TARGETING INFRARED SYSTEM FOR NIGHT (LANTIRN) SIMULATOR
2999	TS SPO	0.249	0.000	6		LANTIRN PART TASK TRAINER
3000	TS SPO	0.088	0.000	6		KC-135 OPERATIONAL FLIGHT TRAINER
3105	TS SPO	0.128	0.000	6		F-15E WEAPON SYSTEM TRAINER (WST)
TOTAL:		27.244	13.786			(SIMULATION AND TRAINING DEVICES IN PE)

(CONTINUED)

(CONTINUATION WITHIN PE 64227F)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
-----					
TOTAL FUNDING IN PROGRAM ELEMENT 64227F :			FY89	FY90	
			-----	-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			63.141	65.186	
-----					

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY:    EDUCATION & TRAINING  
DoD ORGANIZATION:         DLA  
CONTRIBUTING  
PROGRAM ELEMENTS:         64722S JOINT SERVICES MANPOWER AND  
                                 TRAINING SYSTEMS  
  
SYNOPSIS:  
NO SYNOPSIS AVAILABLE

IV-A-13 : LISTING OF DLA IN EDUCATION AND TRAINING

64722S					JOINT SERVICES MANPOWER AND TRAINING SYSTEMS
0001	DLA	5.872	4.991	6F	MANPOWER AND TRAINING SYSTEMS DEVELOPMENT
0002	TPDC	3.901	3.987	6E	INTEGRATION OF TRAINING AND PERFORMANCE DATA
	TOTAL:	9.774	8.979	(EDUCATION AND TRAINING IN PE)	

TOTAL FUNDING IN PROGRAM ELEMENT 64722S :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	9.773	8.978

IV.B. MANPOWER, PERSONNEL AND TRAINING PROGRAM  
GOAL LISTINGS  
-----

GOALS AND SUB-GOALS	PAGE
1. Management Tradeoffs	IV-B-1
A. Manpower Models and Trade-Offs	
B. Compensation Issues	
C. Career Issues	
D. Reserve Issues	
E. Military-Civilian Issues	
F. Organizational Issues	
G. Mobilization Issues	
H. Equal Opportunity Issues	
I. National Trends	
J. Presidential and Congressional Issues	
K. Studies with Foreign Affairs/Policy Implications	
2. Accession and Retention	IV-B-2
A. Forecasting of Supply	
B. Skills and Specialties	
C. Recruiting System Issues	
D. Selection and Classification	
E. Reserve Manpower	
3. Unit Productivity	IV-B-3
A. Measurement/Prediction of Individual and Unit	
B. Enhancement of Individual and Unit	
C. Effectiveness/Analysis and Trade-offs of Methods and Processes	
4. Designing for System Readiness	IV-B-4
A. Front-end Analytical Techniques	
B. Human Capabilities and Design Criteria	
C. Techniques/Methods for Improved Operability	
D. Techniques/Methods for Improved Maintainability	
E. Test, Evaluation and Effectiveness Measurement Methods	

(continued on next page)

GOAL LISTINGS  
(continued)

- |   |        |
|---|--------|
| 5. Improved Sustainability                      | IV-B-5 |
| A. Maintaining Individual and Unit Capabilities |        |
| B. Improved Logistical Support                  |        |
| C. Deficiency Measurement and Improvement       |        |
| D. Improved Technical Documentation             |        |
| E. Wartime Factors of Special Concern           |        |
| F. Routine Effectiveness Issues                 |        |
| G. Combat Effectiveness Issues                  |        |
| 6. Training Systems                             | IV-B-6 |
| A. Management Trade-offs                        |        |
| B. Acquisition Issues                           |        |
| C. Utilization Issues                           |        |
| D. Cost-Effectiveness Issues                    |        |
| E. Design and Analytical Issues and Methods     |        |
| F. Improved Instructional Strategies            |        |
| G. Critical Technologies                        |        |
| H. Support System Issues                        |        |
| Various   | IV-B-7 |



IV-B-1 : LISTING OF NAVY IN GOAL 1 -- MANAGEMENT TRADE-OFFS

TOTAL FUNDING IN PROGRAM ELEMENT 63732M :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	3.092	4.078

IV-B-2 : LISTING OF ARMY IN GOAL 2 -- ACCESSION AND RETENTION

62785A				MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY	
A791-MP	ARI	3.901	9.102	MP 2	MANPOWER, PERSONNEL AND TRAINING
		-----	-----		
		3.910	9.102	TOTAL GOAL 2 IN PE	

TOTAL FUNDING IN PROGRAM ELEMENT 62785A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	17.739	17.050

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(CONTINUATION)

IV-B-2 : LISTING OF ARMY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A792	ARI	9.908	6.499	MP	2	MANPOWER AND PERSONNEL
		9.908	6.500	TOTAL GOAL 2 IN PE		

TOTAL FUNDING IN PROGRAM ELEMENT 63007A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	29.198	18.965

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(CONTINUATION)

IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CF31P14	NPRDC	0.455	0.525	MP	2	MARINE CORPS MANPOWER & TRAINING TECHNOLOGY
		-----	-----			
		0.456	0.525			TOTAL GOAL 2 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62131M :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	0.455	0.525

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(CONTINUATION)

IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA
RM33M20	NPRDC	2.640	2.738	MP	2	MANPOWER AND PERSONNEL TECHNOLOGY
		-----	-----			
		2.641	2.738			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62233N :						
						FY89      FY90
						-----      -----
						THE PRESIDENT'S BUDGET, JANUARY 1989    6.700    6.950

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(CONTINUATION)

IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63707N						MANPOWER AND PERSONNEL SYSTEMS
R1770	NPRDC	3.976	4.115	MP	2	MANPOWER AND PERSONNEL SYSTEMS
		-----	-----			
		3.977	4.115			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63707N :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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(CONTINUED)

(CONTINUATION)

IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64703N						PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
R1822	NPRDC	1.017	1.021	MP	2	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
		-----	-----			
		1.017	1.021			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64703N :						
						FY89      FY90
						-----      -----
						THE PRESIDENT'S BUDGET, JANUARY 1989    1.017    1.021
-----						

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(CONTINUATION)

IV-B-2 : LISTING OF AF IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
61102F						DEFENSE RESEARCH SCIENCES
2313-T1	AFHRL	0.911	0.902	MP	2	LEARNING ABILITIES MEASUREMENT PROGRAM
		-----	-----			
		0.912	0.903			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61102F :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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(CONTINUATION)

IV-B-2 : LISTING OF AF IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
62205F						PERSONNEL, TRAINING, AND SIMULATION
7719	AFHRL	3.370	2.746	MP	2	FORCE ACQUISITION AND DISTRIBUTION SYSTEM
		-----	-----			
		3.371	2.747			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62205F :			FY89		FY90	
			-----		-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			30.853		29.018	
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(CONTINUATION)

IV-B-2 : LISTING OF AF IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2922	AFHRL	0.691	0.739	MP	2	PERSONNEL ASSESSMENT SYSTEMS
		-----	-----			
		0.692	0.739			TOTAL GOAL 2 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63227F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	8.508	7.829

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(CONTINUATION)

IV-B-2 : LISTING OF AF IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
3775	TS SPO	0.000	0.500	MP	2A	MANPOWER, PERSONNEL, AND TRAINING
		-----	-----			
		0.000	0.501			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64227F :						
						FY89
						-----
THE PRESIDENT'S BUDGET, JANUARY 1989						63.141
						-----
						FY90
						-----
						65.186
						-----

IV-B-3 : LISTING OF ARMY IN GOAL 3 -- UNIT PRODUCTIVITY

22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051

B74F-ET      ARI      0.804    0.701    ET    3      UNIT PERFORMANCE

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

(CONTINUED)

(CONTINUATION)

IV-B-3 : LISTING OF NAVY IN GOAL 3 -- UNIT PRODUCTIVITY

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04208	ONR	2.759	3.378	MP	3	GROUP PSYCHOLOGY
		2.760	3.378			TOTAL GOAL 3 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	11.498	14.075

(CONTINUED)

(CONTINUATION)

IV-B-3 : LISTING OF NAVY IN GOAL 3 -- UNIT PRODUCTIVITY

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63739N						NAVY LOGISTICS PRODUCTIVITY
T1885	NPRDC	0.976	1.187	HF	3	QUALITY IMPROVEMENT
T1886	NPRDC	0.488	0.259	HF	3	NEW TECHNOLOGY
		-----	-----			
		1.464	1.447			TOTAL GOAL 3 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63739N :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	1.464	1.446

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(CONTINUED)

(CONTINUATION)

IV-B-3 : LISTING OF AF IN GOAL 3 -- UNIT PRODUCTIVITY

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
7734	AFHRL	0.827	0.780	MP	3	FORCE MANAGEMENT SYSTEM
		0.828	0.780			TOTAL GOAL 3 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

(CONTINUED)



(CONTINUATION)

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62716A						HUMAN FACTORS ENGINEERING TECHNOLOGY
AH70	HEL	7.859	14.894	HF	4	HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT
		-----	-----			
		7.860	14.894			TOTAL GOAL 4 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62716A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	15.003	14.894

(CONTINUED)

(CONTINUATION)

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A790-HF	ARI	2.708	2.300	HF	4	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
		-----	-----			
		2.708	2.300			TOTAL GOAL 4 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62785A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	17.739	17.050

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(CONTINUED)

(CONTINUATION)

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A793	ARI	8.322	5.900	HF	4	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS
A796	HEL	0.000	0.700	HF	4	HUMAN FACTORS ENGINEERING IN SYSTEMS DESIGN
		-----	-----			
		8.323	6.601	TOTAL GOAL 4 IN PE		
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
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(CONTINUED)

(CONTINUATION)

IV-B-4 : LISTING OF NAVY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
------------	------------------------	---------------	--------------------	-----	------	-------------------

61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
--------	--	--	--	--	--	--

RR04209	ONR	2.415	2.959	HF	4	ENGINEERING PSYCHOLOGY
		2.415	2.960			TOTAL GOAL 4 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	11.498	14.075

(CONTINUED)

(CONTINUATION)

IV-B-4 : LISTING OF NAVY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62234N						SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA
RS34H20	NOSC	3.550	3.700	HF	4	HUMAN FACTORS TECHNOLOGY
		3.550	3.701			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62234N :						
THE PRESIDENT'S BUDGET, JANUARY 1989						

(CONTINUED)

(CONTINUATION)

IV-B-4 : LISTING OF NAVY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63701N						HUMAN FACTORS ENGINEERING DEVELOPMENT
R1771	NOSC	1.605	1.663	HF	4	SHIP HUMAN FACTORS ENGINEERING DEVELOPMENT
W0542	NADC	0.849	0.880	HF	4	AIR HUMAN FACTORS ENGINEERING TECHNOLOGY
		-----	-----			
		2.454	2.544			TOTAL GOAL 4 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63701N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	-----	-----
	2.454	2.543

(CONTINUED)

(CONTINUATION)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61102F						DEFENSE RESEARCH SCIENCES
2313-A4	AFOSR	7.927	7.847	HF	4	COGNITIVE SCIENCE
2313-T3	AFHRL	0.273	0.273	ST	4	PERCEPTUAL AND COGNITIVE DIMENSIONS OF PILOT BEHAVIOR
		8.200	8.120			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61102F :						
THE PRESIDENT'S BUDGET, JANUARY 1989						

(CONTINUED)

(CONTINUATION)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
62202F						HUMAN SYSTEMS TECHNOLOGY
06MD	HSD	4.121	4.529	HF	4	HUMAN SYSTEMS DIVISION LABORATORY OPERATIONS
6893	HSD	1.417	1.400	HF	4	MANNED WEAPON SYSTEMS EFFECTIVENESS
7184	HSD	5.855	6.488	HF	4	MAN-MACHINE INTEGRATION TECHNOLOGY
		-----	-----			
		11.394	12.417			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62202F :			FY89		FY90	
			-----		-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			11.393		12.417	
-----						

(CONTINUED)



(CONTINUATION)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
1710	AFHRL	3.640	2.991	HF	4	LOGISTICS AND MAINTENANCE TECHNOLOGY
		-----	-----			
		3.641	2.991			TOTAL GOAL 4 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

(CONTINUED)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

TOTAL FUNDING IN PROGRAM ELEMENT 63106F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	14.962	9.616

(CONTINUED)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

TOTAL FUNDING IN PROGRAM ELEMENT 63231F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	6.536	6.595

TOTAL FUNDING IN PROGRAM ELEMENT 63231F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	6.536	6.595

TOTAL FUNDING IN PROGRAM ELEMENT 62234N :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	4.150	4.250

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
------------	---------------------	------------	------------	----------	------	-------------------

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	7.369	6.772

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
62727A						NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY
A230	PMTRADE	3.429	4.424	ST	6	NON-SYSTEM TRAINING DEVICES
		-----	-----			
		3.430	4.425			TOTAL GOAL 6 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62727A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	3.429	4.424

-----

(CONTINUED)

IV-B-6 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

(CONTINUED)

IV-B-6 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 63003A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	5.379	4.022

(CONTINUED)



(CONTINUATION)

IV-B-6 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A794	ARI	5.985	3.560	ET	6	EDUCATION AND TRAINING
A795	ARI	4.983	2.306	ST	6	TRAINING SIMULATION
		-----	-----			
		10.969	5.867			TOTAL GOAL 6 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63007A :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	29.198	18.965

-----

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715A						NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT
D241	PMTRADE	15.251	29.198	ST	6	NON-SYSTEM TRAINING DEVICES COMBINED ARMS
D573	PMTRADE	6.539	8.568	ST	6B	PROJECT MANAGER FOR TRAINING DEVICES AND NAVAL TRAINING SYSTEMS CENTER SUPPORT
		-----	-----			
		21.791	37.766			TOTAL GOAL 6 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 64715A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	-----	-----
	21.790	37.766

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64722A						EDUCATION AND TRAINING SYSTEMS DEVELOPMENT
D750	ARI	6.872	1.978	ET	6	EDUCATION AND TRAINING SYSTEMS DEVELOPMENT
		-----	-----			
		6.873	1.979			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64722A :						FY89      FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						----- 6.872      1.978

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
64801A						AVIATION ENGINEERING DEVELOPMENT
D275	PMTRADE	4.389	7.413	ST	6D	SYNTHETIC FLIGHT TRAINING SYSTEMS
DE70	PMTRADE	2.785	4.286	ST	6D	AVIATION NON-SYSTEM TRAINING DEVICES
		-----	-----			
		7.175	11.700			TOTAL GOAL 6 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 64801A :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	7.174	11.699

-----

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04206	ONR	6.324	7.741	ET	6	PERSONNEL AND TRAINING
		-----	-----			
		6.325	7.742			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61153N :						
THE PRESIDENT'S BUDGET, JANUARY 1989						
-----						

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA
RM33T21	NTSC	1.493	1.511	ST	6F	INSTRUCTIONAL TECHNOLOGY
RM33T23	NPRDC	1.444	1.498	ET	6	EDUCATION AND TRAINING TECHNOLOGY
RM33T24	NTSC	1.123	1.203	ST	6	SIMULATION AND TRAINING DEVICE TECHNOLOGY
		----- 4.061	----- 4.213			TOTAL GOAL 6 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62233N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	----- 6.700	----- 6.950

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63720N						EDUCATION AND TRAINING
R1772	NPRDC	6.153	6.376	ET	6	EDUCATION AND TRAINING
		-----	-----			
		6.154	6.377	TOTAL GOAL 6 IN PE		
TOTAL FUNDING IN PROGRAM ELEMENT 63720N :						
						FY89      FY90
						-----
						THE PRESIDENT'S BUDGET, JANUARY 1989    6.153    6.376
-----						

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
63733N						SIMULATION AND TRAINING DEVICE TECHNOLOGY
W1773	NTSC	6.451	6.685	ST	6	SIMULATION AND TRAINING DEVICES
		-----	-----			
		6.452	6.686	TOTAL GOAL 6 IN PE		
TOTAL FUNDING IN PROGRAM ELEMENT 63733N :			FY89		FY90	
			-----		-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			6.451		6.685	
-----						

(CONTINUED)



(CONTINUATION)

IV-B-6 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715N						SURFACE WARFARE TRAINING
S1126	NTSC	0.044	0.000	ST	6	SURFACE TOMAHAWK TRAINER
S1140	NTSC	2.484	0.999	ST	6	TACTICAL ADVANCED COMBAT DIRECTION ELECTRONIC WARFARE (TACDEW) MODIFICATION
S1427	NTSC	11.193	7.395	ST	6	SURFACE TACTICAL TEAM TRAINER
S1436	NTSC	1.451	0.000	ST	6	SURFACE WARFARE TRAINING ANALYSIS
S1834	NTSC	3.581	9.293	ST	6	LANDING CRAFT AIR CUSHION (LCA <sup>C</sup> ) OPERATOR TRAINER
		18.753	17.688			TOTAL GOAL 6 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 64715N :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	18.753	17.687

(CONTINUED)

IV-B-6 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2363	AFHRL	1.048	0.400	ST	6	ADVANCED VISUAL TECHNOLOGY SYSTEM
2364	AFHRL	1.000	0.000	ET	6	TRAINING AND PERFORMANCE DATA CENTER
2557	AFHRL	1.270	0.000	ST	6	ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)
2743	AFHRL	3.208	3.790	ST	6	AIRCREW COMBAT MISSION ENHANCEMENT (ACME)
2949	AFHRL	0.821	1.200	ET	6	BASIC JOB SKILLS ASSESSMENT AND ENHANCEMENT
3057	AFHRL	0.470	1.700	ST	6	INTELLIGENT COMPUTER-ASSISTED TRAINING (ICAT)
		7.818	7.091			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						FY89      FY90
THE PRESIDENT'S BUDGET, JANUARY 1989						8.508      7.829

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
2325	TS SPO	2.023	3.085	ST	6	SIMULATOR DEVELOPMENT ACTIVITIES
2769	TS SPO	5.373	2.000	ST	6	SIMULATOR UPDATE DEVELOPMENT
2851	TS SPO	3.104	2.300	ST	6	STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM
2901	TS SPO	6.507	5.500	ST	6	B-1B WEAPON SYSTEM TRAINER (WST)
2968	TS SPO	1.936	0.300	ST	6	MODULAR SIMULATOR DESIGN
2997	TS SPO	0.535	0.000	ST	6	GBU-15 PART TASK TRAINER
2998	TS SPO	7.300	0.600	ST	6	LOW ALTITUDE NAVIGATION AND TARGETING INFRARED SYSTEM FOR NIGHT (LANTIRN) SIMULATOR
2999	TS SPO	0.249	0.000	ST	6	LANTIRN PART TASK TRAINER
3000	TS SPO	0.088	0.000	ST	6	KC-135 OPERATIONAL FLIGHT TRAINER
3105	TS SPO	0.128	0.000	ST	6	F-15E WEAPON SYSTEM TRAINER (WST)
3135	TS SPO	2.580	10.000	ET	6	ADVANCED TRAINING SYSTEM (ATS)
3143	TS SPO	1.900	0.000	ET	6	ADVANCED TACTICAL FIGHTER (ATF)
3282	TS SPO	28.467	31.801	ET	6	C-17 AIRCREW TRAINING SYSTEM (ATS)
3772	TS SPO	2.950	9.100	ET	6H	C-141 AIRCREW TRAINING SYSTEM (ATS)

(CONTINUED)

IV-B-6 : LISTING OF DLA IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 64722S :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	9.773	8.978

TOTAL FUNDING IN PROGRAM ELEMENT 64722S :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	9.773	8.978

IV-B-7 : LISTING OF ARMY IN GOAL VAR--VARIOUS GOAL AREAS

62716A HUMAN FACTORS ENGINEERING TECHNOLOGY

7.145	0.000	TOTAL GOAL VAR IN PE
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(CONTINUED)

(CONTINUATION WITHIN PE 64227F)

IV-B-6 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
=====					
		63.141	64.687	TOTAL GOAL 6 IN PE	
TOTAL FUNDING IN PROGRAM ELEMENT 64227F :			FY89	FY90	
			-----	-----	
THE PRESIDENT'S BUDGET, JANUARY 1989			63.141	65.186	
-----					

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
-----						
64243F						MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT
3817	HSD	0.000	0.497	ET	6F	FORECEWIDE TRAINING SYSTEMS
		-----	-----			
		0.000	0.498	TOTAL GOAL 6 IN PE		

TOTAL FUNDING IN PROGRAM ELEMENT 64243F :	FY89	FY90
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1989	0.000	0.497

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(CONTINUED)



(CONTINUATION)

IV-B-7 : LISTING OF ARMY IN GOAL VAR--VARIOUS GOAL AREAS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
=====						
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ET	ARI	1.005	0.000	ET	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-HF	ARI	2.011	0.000	HF	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-MP	ARI	2.370	0.000	MP	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-ST	ARI	1.795	0.000	ST	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
		-----	-----			
		7.182	0.000			TOTAL GOAL VAR IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						
						FY89      FY90
						-----
THE PRESIDENT'S BUDGET, JANUARY 1989						17.739    17.050
-----						

(CONTINUED)

(CONTINUATION)

IV-B-7 : LISTING OF AF IN GOAL VAR--VARIOUS GOAL AREAS

PE/PROJECT	PERFORMING ORGANIZ.	FY89 (\$M)	FY90 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-ET	AFHRL	2.960	3.418	ET	V A R	LABORATORY SUPPORT
06HT-HF	AFHRL	1.939	2.239	HF	V A R	LABORATORY SUPPORT
06HT-MP	AFHRL	2.144	2.475	MP	V A R	LABORATORY SUPPORT
06HT-ST	AFHRL	3.164	3.653	ST	V A R	LABORATORY SUPPORT
		-----	-----			
		10.208	11.785			TOTAL GOAL VAR IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY89	FY90
THE PRESIDENT'S BUDGET, JANUARY 1989	30.853	29.018

VI. APPENDIXES

APPENDIX A  
CONGRESSIONAL CATEGORIES  
-----

ET EDUCATION AND TRAINING  
-----

ET1 -- Education and Training (6.1)  
ET2 -- Curriculum Development  
ET3 -- Methods and Media  
ET4 -- Management Systems  
ET5 -- Effectiveness Evaluation  
ET6 -- Technology Transfer  
ET7 -- Special Applications

HF HUMAN FACTORS  
-----

HF1 -- Human Factors (6.1)  
HF2 -- Human Related Studies  
HF3 -- Human-Machine Related Studies  
HF4 -- Human-Machine-Mission Related Studies

MP MANPOWER AND PERSONNEL  
-----

MP1 -- Manpower and Personnel (6.1)  
MP2 -- Occupational Requirements and Structures  
MP3 -- Resources Management  
MP4 -- Recruitment, Accession and Placement  
MP5 -- Career Development  
MP6 -- Productivity and Effectiveness  
MP7 -- Civilian and Military Workforce Development

ST SIMULATION AND TRAINING DEVICES  
-----

ST1 -- Visual Simulation Technology (6.1)  
ST2 -- Force/Motion Cue Simulation Technology  
ST3 -- Sensor Simulation Technology  
ST4 -- Instructional Features  
ST5 -- Maintenance Training Simulation  
ST6 -- Weapons Fire Simulation  
ST7 -- Specialized Training Devices

APPENDIX B

MANPOWER, PERSONNEL AND TRAINING GOALS AND SUB-GOALS

-----

1. Management Trade-offs
  - A. Manpower Models and Trade-Offs
  - B. Compensation Issues
  - C. Career Issues
  - D. Reserve Issues
  - E. Military-Civilian Issues
  - F. Organizational Issues
  - G. Mobilization Issues
  - H. Equal Opportunity Issues
  - I. National Trends
  - J. Presidential and Congressional Issues
  - K. Studies with Foreign Affairs/Policy Implications
2. Accession and Retention
  - A. Forecasting of Supply
  - B. Skills and Specialties
  - C. Recruiting System Issues
  - D. Selection and Classification
  - E. Reserve Manpower
3. Unit Productivity
  - A. Measurement/Prediction of Individual and Unit
  - B. Enhancement of Individual and Unit
  - C. Effectiveness/Analysis and Trade-offs of Methods and Processes
4. Designing for System Readiness
  - A. Front end Analytical Techniques
  - B. Human Capabilities and Design Criteria
  - C. Techniques/Methods for Improved Operability
  - D. Techniques/Methods for Improved Maintainability
  - E. Test, Evaluation and Effectiveness Measurement Methods

(continued on next page)

GOALS AND SUB-GOALS  
(continued)

- 5. Improved Sustainability
  - A. Maintaining Individual and Unit Capabilities
  - B. Improved Logistical Support
  - C. Deficiency Measurement and Improvement
  - D. Improved Technical Documentation
  - E. Wartime Factors of Special Concern
  - F. Routine Effectiveness Issues
  - G. Combat Effectiveness Issues
  
- 6. Training Systems
  - A. Management Trade-offs
  - B. Acquisition Issues
  - C. Utilization Issues
  - D. Cost-Effectiveness Issues
  - E. Design and Analytical Issues and Methods
  - F. Improved Instructional Strategies
  - G. Critical Technologies
  - H. Support System Issues

Various

# APPENDIX C

UNCLASSIFIED TO BE COMPLETED IN 1980  
(BY SERVICE)

FE	PRG	AMOUNT	DESCRIPTION
<b>ARMY</b>			
627194	A21	1.000	ADMINISTRATION AND MANAGEMENT - HUMAN
			ADMINISTRATION AND MANAGEMENT - HUMAN
62785A	A2AL-EL	1.000	ADMINISTRATION AND MANAGEMENT - ARMY
			RESEARCH INSTITUTE (ARI)
	A2AL-HE	2.000	ADMINISTRATION AND MANAGEMENT - ARMY
			RESEARCH INSTITUTE (ARI)
	A2AL-HP	2.000	ADMINISTRATION AND MANAGEMENT - ARMY
			RESEARCH INSTITUTE (ARI)
	A2AL-HST	1.755	ADMINISTRATION AND MANAGEMENT - ARMY
			RESEARCH INSTITUTE (ARI)
		10.000	TOTAL FOR ARMY
<b>NAVY</b>			
63732M	10075	3.002	HUMAN RESOURCES MANAGEMENT AND
			FORECASTING
64715N	S1126	0.044	SURFACE TOMAHAWK TRAINER
	S1436	1.451	SURFACE WARFARE TRAINING ANALYSIS
		4.587	TOTAL FOR NAVY
<b>AIR FORCE</b>			
63227F	2364	1.000	TRAINING AND PERFORMANCE DATA CENTER
	2557	1.270	ADVANCED ON-THE-JOB TRAINING SYSTEM
			(AOTS)
64227F	2997	0.535	GBU-15 PART TASK TRAINER
	2999	0.249	LANTIRN PART TASK TRAINER
	3000	0.088	KC-135 OPERATIONAL FLIGHT TRAINER
	3105	0.128	F-15E WEAPON SYSTEM TRAINER (WST)
	3143	1.900	ADVANCED TACTICAL FIGHTER (ATF)
		5.170	TOTAL FOR AIR FORCE

PROJECTS TO BE COMPLETED IN FY89  
(BY CONGRESSIONAL CATEGORY)

PE	PROJ	FY89(\$M)	TITLE
-----			
EDUCATION AND TRAINING			
ARMY	62785A	A2AL-ET	1.005
			ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
AF	63227F	2364	1.000
			TRAINING AND PERFORMANCE DATA CENTER
AF	64227F	3143	1.900
			ADVANCED TACTICAL FIGHTER (ATF)
			-----
			3.905
			TOTAL FOR EDUCATION AND TRAINING
HUMAN FACTORS			
ARMY	62716A	A1QL	7.144
			ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)
ARMY	62785A	A2AL-HF	2.011
			ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
			-----
			9.155
			TOTAL FOR HUMAN FACTORS
MANPOWER AND PERSONNEL			
ARMY		A2AL-MP	2.370
			ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
MC	63732M	C0073	3.092
			HUMAN RESOURCES MANAGEMENT AND FORECASTING
			-----
			5.462
			TOTAL FOR MANPOWER AND PERSONNEL
SIMULATION AND TRAINING DEVICES			
ARMY	52785A	A2AL-ST	1.795
			ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
NAVY	64715N	S1126	0.044
			SURFACE TOMAHAWK TRAINER
NAVY		S1436	1.451
			SURFACE WARFARE TRAINING ANALYSIS
AF	63227F	2557	1.270
			ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)
AF	64227F	2997	0.535
			GBU-15 PART TASK TRAINER
AF		2994	0.249
			LANTIRN PART TASK TRAINER
AF		3000	0.088
			KC-135 OPERATIONAL FLIGHT TRAINER
AF		3105	0.128
			F-15E WEAPON SYSTEM TRAINER (WST)
			-----
			5.560
			TOTAL FOR SIMULATION AND TRAINING DEVICES



# APPENDIX D

## PROJECTS TO BE INITIATED IN FY90 (BY SERVICE)

PE	PROJ	FY90(\$M)	TITLE
-----			
ARMY			
63007A	A796	0.700	HUMAN FACTORS ENGINEERING IN SYSTEMS DESIGN
		-----	
		0.700	TOTAL FOR ARMY
AIR FORCE			
64227F	3775	0.500	MANPOWER, PERSONNEL, AND TRAINING
64243F	3817	0.497	FORECEWIDE TRAINING SYSTEMS
		-----	
		0.997	TOTAL FOR AIR FORCE

PROJECTS TO BE INITIATED IN FY90  
(BY CONGRESSIONAL CATEGORY)

PE	PROJ	FY90(\$M)	TITLE
-----			
EDUCATION AND TRAINING			
-----			
AF	3817	0.497	FORECEWIDE TRAINING SYSTEMS
		-----	
		0.497	TOTAL FOR EDUCATION AND TRAINING
HUMAN FACTORS			
-----			
ARMY	63007A	A796	0.700 HUMAN FACTORS ENGINEERING IN SYSTEMS DESIGN
			-----
		0.700	TOTAL FOR HUMAN FACTORS
MANPOWER AND PERSONNEL			
-----			
AF	64227F	3775	0.500 MANPOWER, PERSONNEL, AND TRAINING
			-----
		0.500	TOTAL FOR MANPOWER AND PERSONNEL

APPENDIX E  
RELEVANT POLICY-LEVEL MEMORANDA  
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17 AUG 1978	Manpower and Logistics Concerns for New Major Systems
No Date	Increased Emphasis on Training and Personnel Systems Technologies
23 JAN 1979	Establishment of DoD Technology Advisory/Coordination Groups
10 OCT 1979	Application of Emerging Training and Personnel Systems Technologies
19 OCT 1979	Coordination of People-Related R&D
30 OCT 1979	Simulation and Training Devices Technology
26 NOV 1979	Increasing Demands for Personnel and Training R&D
11 DEC 1979	Navy Manpower, Personnel and Training Research, Development and Studies Program (MPT RD&S)
29 JAN 1981	Effectiveness of U.S. Forces Can Be Increased Through Improved Weapon System Design
12 FEB 1981	The Research and Development Information System (RDIS)
26 AUG 1981	Contractor Incentives to Improve Reliability and Support
18 DEC 1981	Guidelines For Assessing Whether Human Factors Were Considered In The Weapon Systems Acquisition Process
02 MAR 1982	Personal Microprocessor-Based Job Aids
25 FEB 1983	Defense Science Board (DSB) Summer Study on Training and Training Technology
11 JUL 1984	Memorandum of Agreement: Defense Training Data and Analysis Center (TDAC)
05 OCT 1984	Training Simulator and Device Guidelines
03 JUN 1986	Defense Training Data and Analysis Center (TDAC) Review
01 MAR 1988	Letter of Agreement; Defense Training Performance Data Center (TDAC) and Army, Navy, Air Force under Office of the Secretary of Defense control